

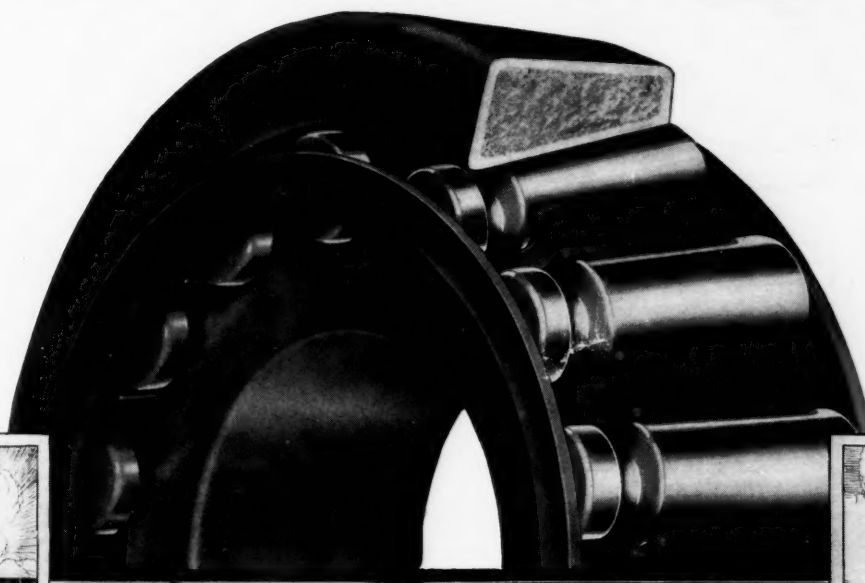
AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Vol. XLIV
Number 20

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AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLIV.

NEW YORK—THURSDAY, MAY 19, 1921

No. 20

Rumors and June 30—Our Industrial Brakes

What follows is a consideration of some interesting questions of today. A few of them are: Who is buying? Why does he hesitate? Is price cutting the remedy? How to check rumors? What can we do?

By Clyde Jennings

RUMORS are the worst feature of the business situation to-day. As a matter of fact, rumors always are the chief source of trouble in a nervous market or an unsettled manufacturing situation. In this case it happens to be a market that is rapidly gaining strength.

Just at this time rumors are especially troublesome to the automotive industry. It is a rumor that keeps John Smith from buying the car that he has been looking at through the plate glass window for the last three months. He has heard many things. Just a few of the things that he has heard are:

The price of this car is to be cut week after next. (The fact that he has heard this once a week since last December makes him more confident as to the truth.)

The company that makes this car is going to bust within a few days and the car will be an orphan.

The dealer that handles this car is going bust and likely the new dealer will not take care of the older purchases.

There is going to be a new car on the market soon, almost like this one that will be sold for about half of the money.

The automobile factories profited heavily during the war and only a few of them have made proper adjustments in their prices.

Dealers are making all kinds of wild allowances for used cars and if he scouts around and gets hold of a pile of junk he can sell to the dealer at a good price.

These rumors are just a few of the things that the prospect is hearing among the "know it alls" whom he meets. The prospect has not recovered from that greatest of all rumor periods, the war, and he is inclined to listen to almost any fantastic tale.

Then there is another circle of rumors that is equally vicious. This is in the stock market centers. The tapes all day long carry notes that this company is "going to cut prices" or "reduce dividends," or both. Also it is told that the manufacturing companies are ignoring service, that service is being used "as a hold up to maintain profits" and so it goes. This particular form of rumor would not have been as important a few years ago as it is now. But in recent months the motor shares, through recently formed banking connections, have become an important factor in the great bourses. A sample of how these rumors break into print is well illustrated by the short article that follows. It was printed at the head of the financial news in a reputable New York newspaper. The headline was "BLUES IN WALL STREET OVER THE MOTORS."

While there was deep gratification over Germany's acceptance of the Allied terms it was not reflected yesterday in the stock market, where the greatest pessimism as to the immediate future of our own industrial situation prevailed. The traders talked of nothing else but dividend cuts and impending cuts.

Most of the rumors of this sort concern various motor companies and the corporations selling them supplies. Unfortunately, the spring boom in the automobile trade has been short lived. Buying has slowed up and the industry is apparently face to face with a readjustment as drastic as that to which other lines of business have been subjected and has in most instances met with liberal reductions in prices.

This necessity now faces the manufacturers and purveyors of cars as well as those who provide the accessories. Reports that another General Motors subsidiary and its principal rival will cut prices 20 per cent next week circulated yesterday, and there were stories of impending dividend cuts all around.

Heavy selling of Chandler was due to the belief that the company will not be able to maintain the quarterly dividend of \$2.50.

American Bosch Magneto, which supplies many of the cars and motor trucks with magnetos, broke to 50½ on the statement that the company has been running into poor business because most of the companies at the beginning of 1921 had an oversupply of these electric distributors. The company has been paying dividends on a \$5 annual basis and the next dividend is to be acted on early in June. The course of the trade in the meantime will determine the action to be taken then.

The effect of these rumors cannot be otherwise than bad, and such publicity as this financial item is especially bad, because a lot of men who deal in Wall street merchandise place great faith in what they hear there. Still more men who have never had an actual interest in anything that is sold in Wall Street, read these articles almost with reverence. The effect of the rumors is as widespread as the American motor trade.

The cure of these evil effects is not plainly seen, but the natural place to expect the answer is in automobile publicity. The reader turns there and finds exactly nothing that has any bearing on the subject that is uppermost in his mind.

Suppose the puzzled prospect turns to the advertisements for cars to find the maker's answer to the many rumors he has heard. It is an even chance that he will find that advertisement to be a wordy effusion on the use of the car for some entirely luxury purpose. He is urged to buy because the car will be a nice plaything for the children, or because he can take a long overland trip, which he cannot afford. Perhaps the price is on the advertisement and perhaps it is not. A year ago all advertisements had prices attached, and the manufacturers were quite proud of those prices. Indeed, a number of them pointed with pride to the price as an evidence of the excellence of the car.

Apparently every automobile and truck manufacturer in the country had a distinct steel-ribbed sales policy early in 1920 and he was proud of his strict adherence to it.

Sad is the contrast to-day.

Last midsummer AUTOMOTIVE INDUSTRIES printed some articles on merchandising—price cutting included—and these are especially good reading to-day. They were not prophetic, they were simply common sense. Some things were said about guarantees that were made when the first price cutting was announced. Some of the guarantees that were then made were withdrawn as soon as possible, others were not. To-day there is not a manufacturer in the industry who put out a hastily made guarantee that does not regret that he did so.

Far be it from any one man to decide whether price cutting is the answer to the present ills of the trade. If the profit on the car is too high, then price cutting is one answer. But the real answer, as to what extent price cutting should be indulged in, must come from the cost sheet in the factory—not from an outsider. But some things can be set down with certainty. All of these things have been said before and will be said again. We venture a few:

There can be no dispute that the psychological attitude of the people is that prices should be cut from the war time standard.

The manufacturer who was well stocked with materials at after war prices is due for a loss.

He is going to take that loss whether he wants to or not. If he does not take it through cuts in sales price, he will take it through sales resistance and idle plant facilities.

A greater loss than inventory markdown is the disruption of an organization. This applies to the factory as well as to the sales field.

Now it is entirely possible that some vehicles to-day are priced at a perfectly reasonable figure, current priced inventories considered. The writer does not believe that the public is either illogical or unfair. It may seem so at times, but in the end it is not. A frank discussion of prices and reasons therefore in an advertisement would appear to be quite the right thing for a car or truck that is properly priced. This advertisement should not be mere "bunk." You cannot fool all of the people all of the time.

Those statements that were put out a year ago about it being impossible to lower prices because labor was not cheaper were "bunk" and they had just as much effect as "bunk" can be expected to have upon an intelligent public.

An automobile manufacturer recently showed to AUTOMOTIVE INDUSTRIES his report that labor in his factory constituted 14 per cent of the cost of his car. And this is quite a complete factory—not a mere assembly plant. The public knows, when it looks at a car, that relatively labor wage is not the chief thing to be considered in fixing the price of that car and it is absurd to expect such "bunk" to prevail. The public also knows that employers are saying freely that labor is more efficient than before—so labor is cheaper. Also the public has heard and believes much about reduced wages and if any particular factory has not reduced its labor prices this factory must say so.

Not long ago AUTOMOTIVE INDUSTRIES reported that a certain car had not been reduced in price. The sales manager of that car objected and showed wherein the actual value of this car had been greatly increased and that the price had not been raised. This, he said, was equal to a reduction. But at that time he had not stated these facts to the public. His letter would have made a very excellent advertisement and would have convinced any intelligent prospect that this car had been reduced in price fully \$200, but the prospect did not hear of this letter. He continued hearing rumors, however.

A group of sales managers recently raised an interesting question in a conference where AUTOMOTIVE INDUSTRIES was represented. It was about like this:

Who are our present customers, where are they getting the money and why are we not getting orders from our dealers for shipments after June 30?

These sales managers were much in earnest. They admitted that they were really surprised at the orders

received at the factories until June 30 and were entirely dissatisfied with what seemed to be in prospect after that date. The representative of AUTOMOTIVE INDUSTRIES answered the question in sections, in the main as follows:

Your present customers are in the main the "white collared class" that suffered so heavily during the war. They are the people sometimes called "middle class," who are the anchor of the great public. It was these people who had the hardest time getting through the war period. Pride caused them to make every effort to maintain a social position, intelligence caused them to continue the education of their children, and patriotism stirred them to heavy purchases of Liberty bonds and other securities. Comparatively their financial condition suffered. Their incomes were not increased in keeping with either the owners of business or with wage earners." Cost of living hit them sharply and their "solid" investments, usually public utilities or safe industrials, did not share in war profits. These people were the last to right their finances after change in living and investment conditions.

These people are now getting their money through an adjustment of the salaries that lagged behind wages and by interest on investments. These are the people who did not sell Liberty Bonds and now their gilt-edged securities that suffered during the war are doing comparatively better than they did during the high profit season.

These are the people who buy cautiously, carefully and with a full ability to pay their obligations. They are the people who used the old car a year or two longer or who put off buying a car.

They are the people who are hardest to fool, because they do not act on impulse or hunch. It is to this class of buyers that a reasonable statement of quality or utility appeals. They do not want cars for purely pleasure; they cannot afford expensive luxuries. They would like very much for the manufacturer to justify their investment, for the purchase of a car is a considerable investment to this prospect. He feels that he must justify himself; not only in the investment as a whole but in the investment of a particular car. He will buy the lowest price car that he is convinced is in keeping with his social position and is economical in operation, other things considered.

The lack of orders after June 30 is because the dealers, either consciously or unconsciously are victims of widespread reports of price cuts on July 1. The factory man must remember that usually the dealer and salesman becomes a friend of his prospect. The prospect lets the salesman know that he puts a certain amount of faith in him and he asks certain questions—regular man to man fashion. This salesman, if he is worth having, does not pledge himself to things he does not know. He has heard that his factory is going to cut prices July 1. Where and when he heard this is not a part of this discussion. He has heard it and the factory has

not said that it is not true. The factory has not announced any policy. When this man to man question is asked, the salesman is in a very embarrassing position. Does he owe his allegiance to the customer or to the factory? If he is as honest as a salesman ought to be, he tells the truth—says he does not know. He does not encourage the prospect. Consequently the dealer who gathers his reports from his salesmen, does not know what the prospects are for after June 30. So the dealer does not order.

Before the dealer can properly estimate his prospects after June 30, he must have a concrete idea of what his own and other factories are going to do.

In other words, the automotive industry must get a sales policy. At present it has none—and worse than that, it is not even answering the criticisms.

It is not strange that under present uncertain questions every shower finds a great many factories a long ways from home without umbrellas. A good many spring frocks have been damaged by these showers. When prices are cut on a well known line, and other

manufacturers are asked about it, they bemoan the cruel fate that brought the shower at that particular time.

Far be it from the writer to say what the policy should be. That requires a careful study of the surroundings in the factory, into the bankbook of the manufacturer, into his reports on vehicles in dealers' hands and into the class of prospects that he hopes to attract. But there is a suggestion that can be passed on. It is this:

The sales reports all indicate many showers this season.

It behooves every person with automobiles to sell to dress accordingly.

If he prefers fine clothes and an umbrella, let him make that choice.

If he prefers a raincoat, that is up to him.

Perhaps he may prefer his golf tweeds.

The point is, let him decide how he is going out to await the showers. No matter what he wears, there is going to be damage, but the chief thing is that whatever dress he adopts, he must expect showers and not run for shelter when they come.

The method in this case is the same as has always won within the factory. Let your public—in this case the prospects—in on your plan and discuss the main problem and its details with them frankly and honestly. Let your dealers know what this policy is to be.

As we talk to dealers, we wonder if the manufacturer realizes just how important the dealer is in his contact with the public. The dealer is the spokesman for the factory, and often the dealer is spokesman for all factories to a particular prospect. It is well that this dealer should be informed as to factory plans. Don't be afraid to tell him.

The loss is in front of you—at least that part you have not written off—so decide how you are going to meet it—quickly or slowly—and then proceed on that plan determinedly and consistently. Perhaps you remember what Grant said about his Vicksburg campaign. Also you remember that he won.

THE automobile and rubber industries have come back in a very definite fashion when some false prophets thought they had taken the full count for the time being. So far they have disappointed those who forecast a mere spurt instead of a continuous performance. There are still few belated thinkers who have overstayed their time and who fail to realize that automobiles are neither a fad nor a mere luxury but an essential and inherent phase of modern life.

—Archer Wall Douglas, chairman of the Committee on Statistics and Standards in Monthly Review of Business Conditions in The Nation's Business.

Purposes of the Foreign Trade Finance Corporation Definitely Stated

There has seemed to be an element of uncertainty in the objects and methods of this new banking institution. In order to dispel this uncertainty, AUTOMOTIVE INDUSTRIES asked certain questions which the officials of the corporation have answered as set forth in the following article.

By George E. Quisenberry*

WHAT specifically does the Foreign Trade Finance Corporation offer to the automotive industry and what are the plans of its organization?

This question is one of exceeding interest, as the officials of this proposed foreign financing institution are endeavoring to close the company's books within the next ninety days and to commence active operations by Sept. 1. For the last four months the corporation has carried on a quiet campaign of education, endeavoring to show to the business interests of this country the imperative need for such an organization formed under the Edge law to solve the credit problems of American exporters. During this quiet campaign, according to officials, a considerable part of the proposed capitalization has been subscribed. Believing that conditions have been bettered to such an extent that the capitalization may be completed shortly, the corporation is now entering upon an intensive effort to complete its stock sales.

The automotive industries thus far have been one of the most liberal supporters of the plan. Several members of the organization committees represent the automotive industry and they have been among its active workers. Consequently, in order that the proposed institution might be better explained, officials of the corporation have been asked to go into more detail concerning its contemplated activities.

Specifically, the corporation plans to finance foreign sales of American products, both raw and manufactured. The extent to which this financing will favor the automotive industry depends upon the extent of support the corporation obtains from that industry in the sale of its stock. In other words, the industry will benefit in proportion to the interest it takes in the Edge organization.

Apportioning Credit

Will the corporation extend foreign credits to the automotive industry if manufacturers and exporters get behind it?

Yes. Under the Edge law, the Foreign Trade Finance Corporation will issue debentures to an amount of ten times its capital stock and can finance foreign trade up to the limit of its debentures plus the total of its capital stock. Another way to say this is that the corporation will be able to finance trade to a value equal to eleven times its capitalization. Theoretically, if the Sennett Motor Company subscribed \$50,000, the corporation could finance its foreign trade to a total of \$550,000, by the use of the original \$50,000 capital and by the sale to the investing public of \$500,000 debenture bonds.

The corporation, however, cannot pledge itself at this time to any definite and concrete financing, such as pledging to the Sennett company an extension of credit totaling \$550,000. The corporation reserves the right to pass upon each proposal for credit; it desires to use its assets in a manner best to promote American export trade in all commodities and it necessarily cannot forecast the channels into which this credit will be sent. The Sennett Motor Company as a stockholder of the corporation would naturally have a favorable standing over a non-stockholder and, undoubtedly, would profit thereby.

How It Will Work

How will the corporation finance foreign sales?

In effect, by opening letters of credit for foreign buyers in New York. When the Sennett company receives an order from, say, Argentina for cars valued at \$75,000 upon which the buyer asks a credit of six or nine months, the Sennett company officials will refer the order to the corporation offices. The branch office of the corporation at Buenos Aires will be asked by cable if the risk is a good one. If so, the corporation will extend such a credit to the Argentine buyer. The Sennett company will ship the goods and obtain payment at New York by presenting the customary documents, the transaction in every way being similar to the present procedure of collecting against a confirmed letter of credit at New York or other ports.

The Sennett company has no connection with the credit in any way. That is entirely between the Foreign Financing Corporation and the buyer in Buenos Aires. The Sennett company forgets any liability for the deal as soon as it has received the money upon its shipping documents.

The only exception in the foregoing would be in a case in which the corporation might, for one reason or another, ask the Sennett company to indorse the paper of the Argentine company. In this case the manufacturer would be a party to the collection of the funds just as he is now in a transaction involving a secondary indorsement.

How to Join

In what way should the automotive industry join the corporation?

By subscribing to stock as individual firms, associations or districts. The corporation considers roughly the United States in districts similar to those of the Federal Reserve Bank. It prefers to consider its financing obligations in terms of these districts rather than by terms of industrial groups or other such divisions. It is active in this because of the fact that there might be need for financing from, say, the cotton and agricultural areas of

*Managing Editor *El Automovil Americano*.

New Orleans and not the automobile manufacturing territory surrounding Detroit or Cleveland. Naturally, the corporation would not wish to tie up a large amount of funds awaiting the need of the Detroit district and failing to extend the required relief to the New Orleans people.

What does the corporation expect to achieve in its financing work?

It expects to take a prominent part in restoring prosperity to American industry. It will achieve its object when foreign buyers of American equipment buy freely in our markets; its profit will be derived from those transactions which are negotiated on long-term credit.

What are the provisions for the subscriptions?

Twenty-five per cent of the stock must be paid on the call of the directors that business will commence. The Edge law further provides that 10 per cent of the remainder shall be paid each sixty days, but objection has been made to this provision and the act is now being amended in Congress so that these additional payments may be made

upon the directors' call. The amendment has passed the Senate and is now before the House with apparently no opposition to it.

Terms of Credit

What specific credits can the corporation provide?

Any credits which have a *longer* time to run than ninety days. In order that the company might not compete with domestic banks the Edge Act provides that ninety-day credits are the minimum. There is no maximum and the credits may continue as long as the bank decides. Branches will be opened in the chief foreign centers to pass upon credits, to supervise collections and to perform other necessary functions.

Has the promotion committee in mind a definite proportion between the capital of a manufacturer and the stock it should subscribe to the corporation?

No definite amount has been worked out, but may be determined on the amount of credit that might be needed.

Motor Cars Equipped for Casinghead Gas Tests

WHEN the casinghead gasoline industry was in its infancy, less than ten years ago, contracts were entered into by most of the mid-continent oil producers for the sale of their casinghead gas, which is the gas produced from oil wells. Gasoline plants were built wherever there appeared to be enough volume to justify their construction. Some of these plants returned large profits to their owners, others proved to be good investments, while a few operated at a considerable loss and were dismantled.

Experience quickly revealed that much of the casinghead gas did not contain enough gasoline to justify plant operation. Quantities of gas could not be conveniently carried to laboratories to be tested. It was not practical to pipe it for that purpose.

Thus necessity brought about the development of the test car, a miniature gasoline plant built on an automobile, to test the casinghead gas at the wells for its gasoline content—the number of gallons of gasoline that can be obtained from each thousand cubic feet of gas.

The use of the test car saves thousands of dollars each year for the buyers of casinghead gas, and insures the sellers an equitable method of determining value in disposing of their product.

The test car also has its use in the daily operation of gasoline plants. By it the critical pressure (the pressure at which the greatest yield is obtained) is found without disturbing the manufacturing process. It is also useful in maintaining the efficiency of the plants and in separating the gases of varying qualities to obtain the maximum yields.

The two principal methods in use to determine the yield in gallons per thousand cubic feet of gas are by compression and absorption tests. There is also the chemical test for the gasoline series in casinghead gas, but this test is seldom used in the field.

The compression test is most frequently employed and is usually designated in the gas selling contract, as the method to be followed in the so-called settlement tests, to arrive at the price to be paid the seller per thousand cubic feet for the gas until the next test is made. These tests are usually made quarterly or semi-annually.

The ordinary single-stage gas testing equipment consists of a small scrubber tank to free the incoming gas from water and whatever oil it may contain, a meter, a single-stage compressor, cooling coil and tank and a

reservoir, called the accumulator tank, for collecting the gasoline as it comes from the coils while still under 200 to 300 pounds pressure. There are also the necessary gages for measuring pressure. All this is mounted on an automobile chassis. The power for operation is sometimes obtained from the automobile engine by jacking up a rear wheel and connecting it to the pulley of the compressor by a belt over a belt band on the rear axle.

In the compression method gasoline is manufactured from casinghead gas in the gasoline plants by compressing the gas in two stages, first by low-pressure and then by high-pressure compressors. With the purpose in view to more closely approximate plant production, it was found necessary in Oklahoma operations to develop a more efficient car than previously used. Instead of the ordinary single-stage, high-pressure apparatus, a two-stage, vacuum pump equipped test car was built. In this case the power is furnished from the engine through an auxiliary shaft direct from the transmission, which eliminates jacking up the rear wheel for power when in operation.

In the principle of operation this car is not very different from the single-stage machine in general use. However, it more nearly parallels the gasoline plant. Its vacuum pump permits of connecting into the lines, carrying the gas under the vacuum without the closing of any gates and a consequential loss of gas to the plant for several hours, and without loss of time to the gas tester waiting for pressure to build on the particular lease to be tested. The two-stage compressor, with both low- and high-pressure cylinders, necessitates the use of two sets of coils and accumulators.

The change in machine, however, does not modify the procedure of testing. This is governed by the rules and regulations made by the United States Interior Department. The minimum number of cubic feet of gas run in a test is ten. In order to eliminate errors in field calculations, 26.42 cu. ft. of gas are used, as this amount, passing through the meter at four ounces of pressure, yields one gallon of gasoline per thousand cubic feet of gas for every one hundred cubic centimeters of gasoline recovered. This is measured with the gasoline at atmospheric pressure after the temperature is raised to sixty degrees Fahrenheit at a rate not to exceed one degree every two minutes.

Many Important Subjects to Be Considered at S. A. E. Standards Meeting

Truck Division to report on recommended practice for important dimensions of front axles for trucks, and on truck body mounting dimensions. Specifications for electric cable among other important recommendations.

THE reports of the Society of Automotive Engineers Standards Committee Divisions covering their work for the first four months of 1921 has been forwarded to members of the Society and will be discussed at the Standards Committee meeting, which will be held at West Baden Springs, Indiana, on May 24. Parts of the report approved at the committee meeting will be submitted at the semi-annual meeting of the Society in session on succeeding days. Copies of the reports can be obtained without charge from the Society of Automotive Engineers, 29 West Thirty-ninth Street, New York City.

The reports consist of complete but concise statements of the practices and constructions recommended, together with such illustrations as are necessary.

The meeting of the Standards Committee, which will be held at the West Baden Springs Hotel, will be open to non-members of the Society who wish to attend. Those technically qualified who wish to discuss any of the reports will have the opportunity to do so. Written discussions submitted to the Standards Committee will also be given full consideration. The reports include recommendations on motor truck hubs, motor truck body installation dimensions, clutch release thrust type ball bearings, roller chains, roller chain sprockets, insulated cable, flexible disk couplings, headlamp brackets, lamp nomenclature, ball studs, exhaust pipes, square shaft fittings, universal joint hubs, radiator drain cocks, stationary engine belt speeds, stationary farm engine ratings, flywheel housings and other automotive parts and materials.

Clutch Release Type Thrust Ball Bearings

The Ball and Roller Bearings Division submits the following table of sizes for clutch release type thrust ball bearings as proposed recommended practice:

CLUTCH RELEASE TYPE THRUST BALL BEARINGS			
Number	Bore	Width	Ball Diameter
1	1 $\frac{3}{8}$	$\frac{5}{8}$	$\frac{1}{8}$
2	1 $\frac{1}{2}$	$\frac{11}{16}$	$\frac{1}{8}$
3	1 $\frac{5}{8}$	$\frac{11}{16}$	$\frac{1}{8}$
4	1 $\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{8}$
5	1 $\frac{7}{8}$	$\frac{3}{4}$	$\frac{1}{8}$
6	2	$\frac{3}{4}$	$\frac{1}{8}$
7	2 $\frac{1}{8}$	$\frac{3}{4}$	$\frac{1}{8}$
8	2 $\frac{1}{4}$	$\frac{11}{16}$	$\frac{3}{16}$
9	2 $\frac{3}{8}$	$\frac{11}{16}$	$\frac{3}{16}$
10	2 $\frac{1}{2}$	$\frac{11}{16}$	$\frac{3}{16}$
11	2 $\frac{3}{4}$	$\frac{11}{16}$	$\frac{3}{16}$
12	3 $\frac{1}{4}$	$\frac{7}{8}$	$\frac{3}{8}$

All dimensions in inches.

These bores and widths are intended for use with bearings with or without assembling bands.

Roller Chain Standardization

The Chain Division recommends the adoption of a standard tooth form, the pressure angle for a 6-tooth

wheel running from 15 to 5 deg. and the pressure angle on a wheel of infinite diameter running from 15 to 30 deg., making the actual working face of the tooth a surface concave to the roller, the radius of which is approximately 1.3 times the diameter of the roller. The complete report covers the exact form of the tooth and the details of the cutters.

The Chain Division recommends also a numbering system for roller chains.

Insulated Cable

The report of the Electrical Equipment Division on Insulated Cable was formulated by a subdivision consisting of cable and passenger car manufacturers after a series of meetings at which the subject was exhaustively discussed. The recommendations of the Division will, if adopted by the Society, supersede the present S. A. E. Standard for Insulated Cable, adopted in 1916, which it is thought is not in accordance with the best engineering practice of to-day.

The proposed specifications cover conductors, cotton separators, rubber insulation, varnished cambric tape, braids, armor, tinning test, physical tests, miscellaneous tests and oil tests for braids as applied to high and low tension cables, and cables used for starting and lighting systems. The recommendations include tables giving armor thickness and width, number and nominal size of wires in stranded cable, thickness of insulation, carrying capacity, outside dimensions, etc. The report contains also a proposed revision of electrical equipment nomenclature.

Report of the Engine Division

The Engine Division recommends certain changes in the thickness of certain sizes of cast iron carburetor flanges used in stationary engines. The division also recommends that the following dimensions be added to the disk clutch flywheel standards:

Crankshaft flange counterbore: minimum diameter, 1 $\frac{3}{4}$ in.; minimum depth, 1/16 in.

Flywheel web thickness of counterbore, $\frac{5}{8}$ in.

Clutch counterbore in flywheel: diameter limits, 11.500 and 11.503 in.; depth, 3/16 in.; corner radius, 1/32 in.

Report on Rating of Storage Batteries for Farm Lighting

The Isolated Electric Lighting Plant Division has, because of dissatisfaction with the standard rating for storage batteries adopted two years ago, prepared the revised rating standard printed below and recommends that it supersede the present standard:

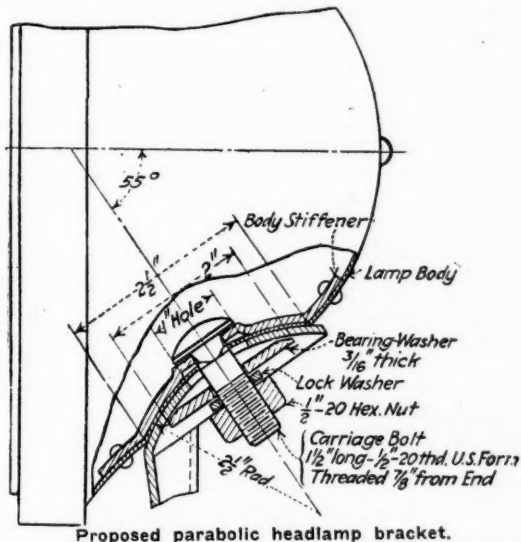
Storage batteries for farm light and power purposes shall be rated in terms of the number of hours discharge capacity at a constant rate corresponding to 300 watts, or fifteen 20-watt lamps.

In determining isolated electric light and power plant battery ratings, manufacturers shall consider:

1. The normal range of specific gravity which is recommended for the battery in service shall be used during the test.
2. The battery rating shall be established at an initial temperature of cells not to exceed 80 deg. Fahr.
3. The watts for rating lead batteries shall be based on a normal voltage of 2 volts per cell. The final voltage on continuous discharge shall not be less than 1.75 volts per cell.
4. The battery to be tested shall not be charged more than 120 per cent (in ampere-hours) of the last previous discharge.
5. The resulting test shall indicate the number of hours of service a lead-acid battery will give when discharged at a constant rate corresponding to 300 watts.
6. At 200 watts, 32 volts, the constant discharge rate shall be 6.25 amps.

Headlamp Brackets

The Headlamp Bracket Subdivision of the Lighting Division has, in cooperation with the lamp manufacturers, developed a universal fender type headlamp bracket which has been tested and found satisfactory in actual practice. This bracket has a spherical mounting surface for the lamp body, the radius of curvature of the surface being $2\frac{1}{2}$ in. The lamp is held to the mounting surface by a single carriage bolt. The advantages of the proposed construction are twofold: the bracket permits universal adjustment of the lamp as well as interchangeability of lamps. The proposed bracket is shown in the cut herewith.



Proposed parabolic headlamp bracket.

Standard nomenclature for various types of lamps is also recommended in the report, while a revision of the present S. A. E. standard for lamp bases, sockets and connectors is proposed.

Miscellaneous Parts and Fittings

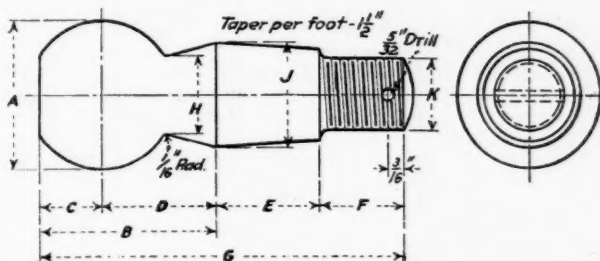
The Parts and Fittings Division recommends for adoption as S. A. E. recommended practice that

The outside diameters of exhaust pipes extending from the engine to the muffler shall conform to the following inch sizes: 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, 3, $3\frac{1}{4}$, $3\frac{1}{2}$ and 4.

This recommendation was formulated in order to reduce the large number of exhaust pipe diameters used in present practice and make it unnecessary for the

muffler and exhaust heater manufacturers to provide for an unnecessarily large number of sizes. Such a standard will be appreciated by the tubing mills and will facilitate deliveries and stocking. The recommendation is intended to apply to future production and is based on a survey of present practice which indicated that the $1\frac{5}{8}$, $1\frac{3}{4}$, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$ and 3-in. pipe sizes were most generally used.

The majority of steering gear connecting rods used are made with separate ball studs as this permits more satisfactory heat treatment. These studs are now made to many designs, differing but slightly in detail, but are much more expensive than standardized studs would be. The following table of proposed standard dimensions is therefore recommended:



No.	A	B	C	D	E	F	G	H	J	K
1	1	$1\frac{3}{8}$	$\frac{7}{8}$	$1\frac{1}{8}$	$\frac{13}{16}$	$\frac{13}{16}$	3	$\frac{5}{8}$	0.766	$\frac{5}{8}$ -18
2	$1\frac{1}{8}$	$1\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{13}{16}$	$\frac{13}{16}$	$3\frac{1}{8}$	$\frac{5}{8}$	0.766	$\frac{5}{8}$ -18
3	$1\frac{1}{4}$	$1\frac{1}{4}$	$\frac{1}{8}$	$1\frac{1}{8}$	1	$\frac{13}{16}$	$3\frac{1}{2}$	$\frac{3}{4}$	0.875	$\frac{5}{8}$ -18
4	$1\frac{1}{2}$	$1\frac{7}{8}$	$\frac{5}{8}$	$1\frac{1}{4}$	$1\frac{1}{8}$	$\frac{7}{8}$	$3\frac{3}{8}$	$\frac{13}{16}$	1.000	$\frac{3}{4}$ -16
5	$1\frac{3}{4}$	$2\frac{1}{8}$	$\frac{3}{4}$	$1\frac{3}{8}$	$1\frac{1}{4}$	1	4	$\frac{13}{16}$	1.250	$\frac{7}{8}$ -14

Proposed standard dimensions for ball studs.

It is recommended that the present S. A. E. standard for square shaft fittings be revised so that the shaft end and nut dimensions conform to the shaft end and nut dimensions of the present S. A. E. standard for taper fittings with plain and slotted nuts.

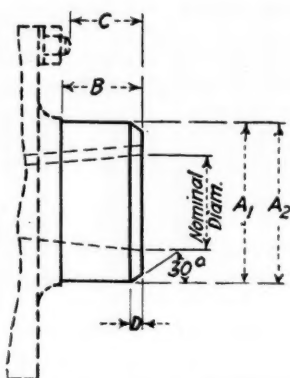
Universal Joint Hubs

In order to obtain better interchangeability between universal joints and transmissions, the Parts and Fittings Division recommends the adoption as S. A. E. Recommended Practice of the universal joint hub dimensions given in the accompanying table. The dimensions specified are of importance to the transmission manufacturers by eliminating many present variations in these parts, and to the transmission purchasers by making available transmissions having standardized shaft-ends.

The original recommendation of the Division, which was circularized among the universal-joint transmission, passenger car and motor truck manufacturers, specified dimensions for the outside diameters of the universal joint companion flange in order to permit the transmission designer to lay out the gearshift rods so that they would clear the companion flange. Criticisms received, however, indicate that the large number of different types and sizes of companion flanges would not permit specifying outside diameters without affecting individual design.

Stationary Engine Belt Speeds

The Stationary Engine Division recommends the adoption of the following belt speeds for stationary engines



Nom- inal Diam.	HUB DIAMETER				Minimum Finished Length (B)	C ²	D
	Lathe Finish (A ₁)		Ground Finish ¹ (A ₂)				
	Max.	Min.	Max.	Min.			
3/4	1.280	1.270	1.253	1.250	5/8	9/16	1 3/4
7/8	1.530	1.520	1.503	1.500	3/4	5/8	1 3/4
1	1.780	1.770	1.753	1.750	3/4	3/4	1 5/8
1 1/8	2.030	2.020	2.003	2.000	7/8	3/4	1 5/8
1 1/4	2.155	2.145	2.128	2.125	7/8	3/4	1 5/8
1 3/8	2.280	2.270	2.253	2.250	1	3/4	1 5/8
1 1/2	2.530	2.520	2.503	2.500	1	3/4	1 5/8
1 3/4	3.030	3.020	3.003	3.000	1 1/4	1 1/8	1 5/8
2	3.280	3.270	3.253	3.250	1 1/2	1 1/8	1 5/8

All dimensions in inches.

¹When specified the maximum eccentricity of the ground surface with respect to the hole shall be 0.002 in. (indicator reading 0.004 in.)

²The transmission design should provide clearance for the least distance from the end of the hub to the end of the flange bolt.

All fittings shall be S. A. E. Standard taper or spline fittings. The nominal diameter applies in either case.

Recommended universal-joint hub dimensions.

used for driving farm power equipment, such as ensilage cutters, milking machines and circular saws.

STATIONARY ENGINE BELT SPEEDS

Nominal Engine Rating, Hp.	Belt Speed, Ft. Per Min.	Nominal Engine Rating, Hp.	Belt Speed, Ft. Per Min.
1 1/2	550	7	1340
1 3/4	600	8	1420
2	680	9	1500
2 1/2	800	10	1575
3	900	12	1700
4	1030	14	1810
5	1150	15	1860
6	1250	16	1910

Stationary Engine Rating

The Stationary Engine Division recommends that the following horse-power formula be adopted as general information for publication in the S. A. E. Handbook as a means of securing uniform practice in rating stationary engines:

$$\text{Nominal Engine Horsepower} = \frac{0.7854 D^2 L R N}{13,000} \quad \text{where}$$

D equals the piston diameter in inches

L equals the stroke in inches

R equals the revolutions per minute of the crankshaft

N equals the number of cylinders.

The formula is based on a piston displacement of 13,000 cu. in. per min. per hp., as this is considered a very fair average factor for stationary and tractor engines burning either kerosene or gasoline. Various mechanical arrangements and refinements will, of course, influence the actual results on any one engine.

The results obtained using this formula are almost exactly 80 per cent of the brake horsepower under average good conditions and provide the desired 20 to 25 per cent of reserve power.

The Stationary Engine Division recommends as S. A. E. Recommended practice the adoption of the crankshaft and crankpin diameters given in the accompanying table.

CRANKSHAFT AND CRANKPIN DIAMETERS FOR STATIONARY ENGINES

Cylinder Bore	Crankshaft and Crankpin Diameter	Cylinder Bore	Crankshaft and Crankpin Diameter
3	1 1/8	5 1/2	2 1/8
3 1/4	1 1/4	6	2 1/4
3 1/2	1 1/4	6 1/2	2 3/8
3 3/4	1 3/8	7	2 1/2
4	1 1/2	7 1/2	2 3/4
4 1/4	1 3/8	8	3
4 1/2	1 3/8	8 1/2	3 1/4
4 3/4	1 3/8	9	3 1/2
5	2	9 1/2	3 3/4
...	...	10	4

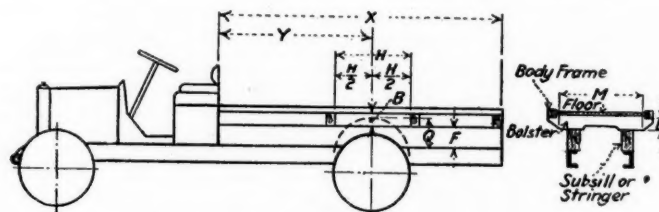
All dimensions in inches.

Other recommendations of the division include a set of dimensions for lubricator cups of various sizes and a table of water pot or hopper capacities for engines of various rated powers.

Motor Truck Bodies and Front Axle Hubs

The subject of motor truck body installation dimensions was first proposed to the Society about two years ago and assigned to the Truck Division. The original plan was to develop a standard which would include dimensions for the mounting of bodies on trucks and also frame widths, distance between spring centers, wheel treads and turning radii. A Subdivision was appointed which obtained considerable data on the practice at that time.

The original program has been reduced so that this proposal includes only dimensions for the stringers, bolsters, distance from the back of the seat to the center



$$F (\text{Subsill}) = (Q + \text{Chain Clearance}) - B$$

Nominal Capacity, Tons	Body Bolster (B)	Length Back of Seat to End of Frame (X)	Length Back of Seat to Center-Line of Rear Axle (Y)	H ¹	Dimension of Bolsters (M)
3/4 to 1	5	108	60	32	36
1 1/4 to 1 1/2	5	120	72	36	38
2 to 2 1/2	5	132	81	36	38
		156	98		
3 to 4	5	144	90	36	42
		192	114		
5 to 6	5	144	90	36	42
		192	114		

¹Dimension H permits a variation of plus or minus 2 1/2 in. of the rear axle from the normal position.
Q is measured from the top of the chassis to the top of the tires when the springs are deflected to the "metal to metal" position.

Recommended dimensions for truck body installation.

of the rear axle, and the distance from the back of the seat to the rear end of the frame. The dimensions were quite generally approved as being suitable for the interchangeable mounting of truck bodies with the exception of special types such as large van bodies and special short dump bodies.

The proposal as now submitted by the Truck Division for adoption as S. A. E. recommended practice is shown in the accompanying drawing and table, and indicates the available space in which bodies may be mounted. The proposal also includes the nomenclature of the body mounting timbers, which at the present time are known by a variety of terms. It is believed that the proposal includes all the necessary dimensions for the installation of truck bodies by body manufacturers on trucks conforming closely to the dimensions given in the table, and that it will answer the requirements for such standardization which had been urged through the technical press for some time.

Readers of AUTOMOTIVE INDUSTRIES will recall that the report of the Truck Division on proposed hub

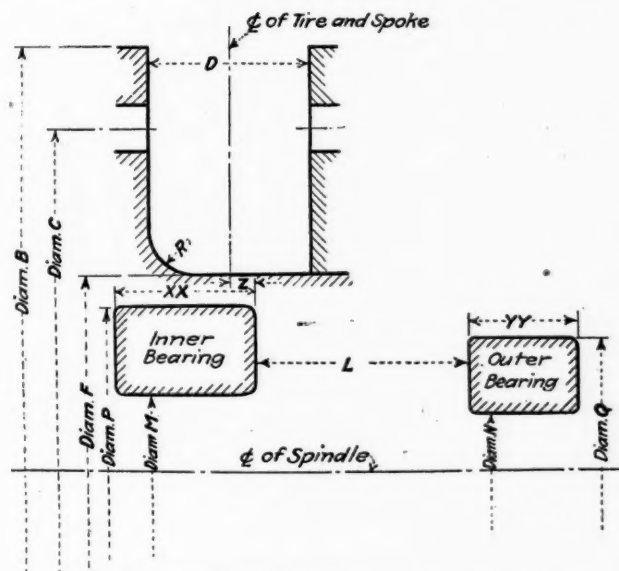


Diagram showing truck front axle hub dimensions referred to in accompanying tables.

TABLE I—DIMENSIONS FOR INCH SIZE TAPER ROLLER BEARING HUBS

Hub and Spindle		BEARING HOLES				
Number	Letter	R5	R6	R7	R8	R9
Diameter of flange.....	B	9	9½	10½	10¾	11¾
Flange fillet radius....	R	½	½	¾	¾	¾
Diameter of bolt circle..	C	7¼	8	8¾	9¼	10¼
Number of flange bolts ..	12	12	12	12	12	12
Diameter of flange bolts..	½	½	½	½	⅝	⅝
Spoke thickness between flanges	D	1¾	2	2¼	2½	2¾
Hub diameter for wheel bore	F	4.125	4.625	5.125	5.563	5.938
Inner edge of inner bearing to centerline of spoke	Z	¼	0	⅞	⅞	1½
Inner bearing shoulder to outer bearing shoulder	L	2⅜	2⅜	2½	3½	3½
Spindle diameter at inner bearing	K	1.7495	1.9995	2.1245	2.4995	2.5620
Spindle diameter at outer bearing.....	N	1.187	1.4995	1.7495	1.9995	1.9995
Hub bore for inner bearing	P	3.481	3.979	4.370	4.729	5.182
Hub bore for outer bearing	Q	2.857	3.154	3.482	3.981	3.981
Overall length of inner bearing	XX	1.5000	1.5000	1.5000	1.7500	2.1250
Overall length of outer bearing only.....	YY	1.1875	1.1563	1.5000	1.5000	1.5000

standards submitted at the annual meeting of the Society last January, was referred back to the committee and later considered at a meeting held in Detroit on March 3. Other meetings of interested manufacturers were held later and the whole matter finally considered by the Truck Division meeting held recently in New York at which representatives of truck, axle, bearing and wheel makers were present. The whole proposal as presented to the Truck Division included two series of spindle sizes with their related parts in considerable detail. After thorough discussion of this proposal, it was deemed best to limit the proposed standard to only such dimensions as are essential for the interchangeability of bearings and wheels on the proposed series of spindles.

The Truck Division therefore recommends for adoption as S. A. E. recommended practice, the dimensions shown in the accompanying drawing and tables for installation of inch size roller bearings and metric ball and roller bearings.

TABLE II—DIMENSIONS FOR BALL BEARING OR METRIC ROLLER BEARING HUBS

Hub and Spindle		BEARING HOUS				
Number	Letter	B5	B6	B7	B8	B9
Diameter of flange....	B	9	9¾	10½	11¼	12¼
Flange fillet radius....	R	½	½	¾	¾	1
Diameter of bolt circle..	C	7¼	8	8¾	9¼	10¼
Number of flange bolts..	12	12	12	12	12	12
Diameter of flange bolts..	½	½	½	½	⅝	⅝
Spoke thickness between flanges	D	1¾	2	2¼	2½	2¾
Hub diameter for wheel bore	F	4.625	5.000	5.563	5.938	6.375
Inner edge of inner bearing to centerline of spoke	Z	1⅞	¾	7⁄8	1⅞	¾
Inner bearing shoulder to outer bearing shoulder	L	2 1⁄8	2¾	2¼	2 3⁄8	2¾
Length of ball bearing spacer	a	2 3⁄8	2 3⁄8	2 3⁄8	3 1⁄8	3 1⁄8
Spindle diameter at inner bearing.....	M	1.7703	1.9671	2.1640	2.3608	2.5577
Spindle diameter at outer bearing.....	N	1.3766	1.5734	1.7703	1.9671	2.1640
Hub bore for inner bearing	P	3.9340	4.3277	4.7214	5.1141	5.5078
Hub bore for outer bearing	Q	3.1488	3.5425	3.9362	4.3299	4.7236
Overall length of inner bearing	XX	1 ⅞	1¾	1 1⁄8	2¾	2 ⅞
Overall length of outer roller bearing only..	YY	1¾	1 7⁄8	1 ⅞	1¾	1 1⁄8

¹ When the outer hub bearing is a ball bearing, the space required for it is $(L + YY) - a$.

With approval of this report by the Standards Committee, it is proposed to continue this work to include a series of similar hub dimensions for passenger car front axle hubs and also if feasible, for a complete line of rear axle hubs for passenger cars and motor trucks.

Chairmen for S. A. E. Summer Meeting Sessions

THE following men are expected to serve as chairmen at the various sessions of the Summer Meeting of the Society of Automotive Engineers, to be held at West Baden, Ind., May 24 to 28: Standards Committee Meeting, afternoon, May 24, B. B. Bachman; Business Session, evening, May 24, President David Beecroft; Aeronautic Session, morning, May 25, Howard E. Coffin; Transportation Session, morning, May 25, H. W. Alden; General Research Session, morning, May 26, H. M. Crane; Combustion Session, morning, May 27, Thomas Midgley, Jr.; Fuel Research Session, morning, May 28, O. C. Berry.

Judges' Report on the 1920 British Tractor Trials

Much delayed notation of decision of event held at Lincoln six months ago is disappointing in that it does not state definitely individual results.

MORE than six months after the event, the judges' report concerning the tractor trials held near Lincoln, England, last September has been issued by the Royal Agricultural Society. It is a disappointing form of report for those makers whose machines did well, for beyond descriptive references and tabulated specifications it does not refer individually to the competing machines—except to mention again the "awards" that were made in the various classes a week or so after the trials.

The actual performances of the competing tractors are set out in one of the tables, but these are merely grouped in the various classes, with minimum, maximum and the average of the five best given under the different headings. The portion of this table dealing with internal combustion engined tractors and self-contained plows is given herewith; from this it will be gathered that, taking the average of each class in cost of fuel and labor per acre, the four-furrow outfits did not show up well compared with those with two and three furrow plows, while there is not much to choose between the two last mentioned and the self-contained three-furrow units.

Explanatory of this table it may be said that where two lines of figures are bracketed in respect of fuel, the second line represents what is termed the cost or consumption per "equivalent" acre, the latter basis being arrived at by reducing the drawbar pull to a standard of 500 lb. per furrow. Actually the drawbar pull varied from 335 lb. to 565 lb. per share in the light land; in the heavy land the maximum was 1250 lb. per furrow. An acre of the latter in the second set of figures would therefore be calculated as $2\frac{1}{2}$ "equivalent" acres.

In the working out of costs kerosene is taken at the price paid at Lincoln, viz., 46 cents per Imperial gallon and gasoline at 82 cents (at normal rate of exchange). Labor is taken at 36 cents per hour.

The judges in their summary refer with approval to the fact that out of thirty-eight competing machines, two only retired during the trials. They also say that the uniformity of excellence greatly increased the difficulties of

judging and that it would have required extreme uniformity (which was lacking) in the general conditions to have warranted arranging the machines in order of merit under the various headings—work done, amount and cost of fuel consumed, drawbar pull, mechanical design, etc. And yet they say that they had no difficulty in selecting the prize winner in each class.

As an appendix to their report, the judges publish two estimates of plowing costs, one from a man who farms in the district in which the trials were held and who gives the cost of horse plowing, and another from a farmer who gives both tractor and horse plowing costs from his own experience. The former's figures enable a comparison to be made between the average of the competing tractors.

The Lincoln farmer referred to gives the average cost of plowing 6 in. deep in the trials district with horses in 1920 as follows:

Light land\$5.60 per acre

Heavy land\$10 to \$11 per acre

The other farmer's estimated costs are:

Tractor Plowing Per Acre

Wear and tear of tractor.....	\$2.50
Kerosene, 4 gal. at 46 cents.....	1.84
Lubricating oil	0.36
Labor—one man at \$17.50 per week; weekly average, 15 acres; cost per acre.....	1.12
Plow, shares, etc	0.60
Cost per acre.....	\$6.42

Horse Plowing Per Day

Three horses at \$2 per day.....	\$6.00
One man and one boy, per day.....	3.60
Plow, shares, etc., per day.....	0.48
Estimated daily work, five-sixths of an acre.....	10.08
Cost per acre.....	\$12.10

Class	Land	No. of Furrows of (All At-6x10 in.)	No. of Tenders	Time in Hours Per Acre Average			Fuel in Imp. Gallons Per Acre Average			Wages, in Cents, Per Acre Average			Fuel Cost, in Cents, Per Acre Average			Total Cost, Labor and Fuel, in Cents, Per Acre	
				Mini- mum	of Five Lowest	Maxi- mum	Mini- mum	of Five Lowest	Maxi- mum	Mini- mum	of Five Lowest	Maxi- mum	Mini- mum	of Five Lowest	Maxi- mum	Mini- mum	Aver. of Whole Class
1 Tractors up to 14 hp.	Light	2	1	1.58	1.92	2.33	{ 2.63 2.82 }	{ 2.90 3.34 }	{ 5.41 7.21 }	57.0	69.0	88.0	{ 121.0 129.8 }	{ 133.4 153.8 }	{ 248.8 331.6 }	178	226
1	Heavy	2	1	1.75	1.96	2.61	{ 3.42 2.31 }	{ 3.84 2.95 }	{ 5.51 3.83 }	63.0	70.6	94.0	{ 157.2 106.2 }	{ 176.8 136.0 }	{ 253.4 176.2 }	220	262
2 Tractors up to 30 hp.	Light	3	1	1.09	1.21	1.99	{ 2.96 1.78 }	{ 3.63 2.05 }	{ 6.51 5.34 }	39.2	43.6	71.6	{ 136.2 80.8 }	{ 167.0 94.0 }	{ 299.4 245.6 }	134	200
2	Heavy	3	1	1.30	1.52	4.00	{ 2.96 1.78 }	{ 3.63 2.05 }	{ 6.51 5.34 }	46.8	54.8	144.0	{ 136.2 80.8 }	{ 167.0 94.0 }	{ 299.4 245.6 }	183	280
3 Tractors up to 30 hp.	Light	4	1	1.21	...	1.60	2.62	...	3.06	43.6	...	57.6	120.4	...	250.8	164	216
3	Heavy	4	1	2.01	...	...	7.12	...	...	72.4	...	...	327.6	...	...	400	400
7 Self-contained plows	Light	3	1	1.46	1.89	2.42	2.21	2.84	4.48	53.6	67.8	87.0	100.6	130.6	206.0	154	223
7	Heavy	3	1	1.30	2.08	3.22	2.27	3.78	6.21	46.8	74.8	116.0	104.4	173.8	285.6	151	316

NOTE.—The figures for minimum time and minimum fuel consumption per acre do not necessarily apply to the same tractor. The same is the case for the maxima.

Features of Mechanical Interrupters for Ignition Systems

Part I

An article pointing out the nature of the functions performed by an interrupter, in relation to other parts of the ignition system, and discussing the fundamental requirements of a well designed interrupter.

By Harry F. Geist

IT is very evident from the amount of attention that has been given to the development and design of the mechanical interrupter that it is a very important element of an ignition system.

It is the purpose of this article to point out the necessary functions that the interrupter has to perform in the operation of the ignition system and to discuss the fundamental considerations that must be borne in mind in the development of a good interrupter and of its connection with the rest of the ignition system.

In the design of such a mechanism as an interrupter, success must be based upon a sound principle and is attained by the proper proportioning of parts, by the proper selection and quality of materials and perhaps most important of all, by the workmanship represented in the quantity production of the mechanism. Because of the fact that the successful operation of the interrupter depends upon so many considerations, criticism of any of the designs shown would be out of place and is not intended. The service that any particular interrupter is giving will speak for itself better than any other form of analysis possibly could.

Evolution of High Tension Ignition Systems

The first electrical high tension ignition systems consisted of a vibrating induction coil that was energized intermittently by a battery of cells. In these induction coils the interrupter consisted of a magnetically operated trembler, constructed integral with the coil and operated by the magnetic action of the coil core, so that the timing of the system depended upon an extra mechanism known as a "timer" that was geared in timed relation to the engine. With such a system every time the timer would complete the circuit between the battery and the primary coil, a shower of sparks would be delivered to the spark plug at a frequency dependent upon the adjustment of the trembler and covering the complete period of closed circuit at the timer.

For multi-cylinder installations, the system required as many induction coils and timer contacts as there were cylinders, so that the timer served also as a distributor in the primary circuit of the system.

The first simplification of this system came in the form of a master vibrator which consisted of one trembler interrupter that was operated electro-magnetically by means separate from the coils and produced the sparks in turn in the particular coil with which the timer connected it.

At this same time the alternating current low tension

magneto was coming into use. It was connected to a suitable step-up coil for energy transformation and was equipped with a mechanical interrupter in the primary circuit and a distributor for the high tension circuit. Both the interrupter and the distributor were constructed integral with the magneto, and were thus timed to the engine. The interrupter in such a system not only served its functions as a circuit breaker but took the place also of the timer. It is this same type of mechanical interrupter that to-day serves to break the primary circuit for spark production and to time the spark to the engine as well.

From this type of magneto and step-up coil system it was natural for the self-contained high tension magneto to follow, thus eliminating the separate step-up coil, but maintaining the same form of mechanical interrupter and high tension distributor.

The success obtained by the use of the mechanical interrupter and its single spark delivery, in the case of magneto systems, made its adoption the logical step in what is now the modern interrupter-distributor battery and coil type of ignition system. So that in the modern high tension ignition system, the mechanical interrupter serves both as circuit interrupter and as timer in both the magneto and the battery and coil systems.

The matter of its serving as a timer to the system is due to the fact that the interrupter is always geared in timed relation to the engine, and since its actuation is always affected by the rotation of the armature in the case of magnetos it is always in timed relation to the electrical firing range of the magneto.

In the case of so-called "variable ignition" the interrupter may be adjusted to actuate at any time desired on the firing range, while for "fixed ignition" the interrupter is always operated at the same piston position.

The principal functions performed by the mechanical interrupter are those affecting the electrical operation of the ignition system when the interrupter "makes" and "breaks" the primary circuit, but before attempting to study these functions, let us first consider a typical interrupter and its mechanical and electrical connections to a high tension magneto.

Interrupter Connections With Magneto

Fig. 1 shows a typical magneto interrupter and its connection with the rest of the machine. The breaker plate carries an insulated plate in which the insulated contact carrying screw is adjustably fitted.

Pivoted upon the breaker plate is also a lever arm

having two projecting ends. At one end of this arm the grounded contact is carried, and a spring, secured at one of its ends to the lever arm and at the other end to the breaker plate, tends normally to hold the two contacts together. These contacts are usually of a platinum-iridium alloy. At the other projecting lever end, a fibre bumper block is inserted for co-action with the cams, so that the rotation of the breaker plate produces an opening of the contacts every time the bumper block engages a cam.

The lever arm pivot fits into a fibre bushed bearing so that oil will not be necessary for lubrication. It is very important that the lever arm works easily on its pivot, without being loose, and it is especially important that it shall never stick. A retaining spring (not shown in Fig. 1 but shown in Fig. 9) is adapted to hold the lever arm in place upon the breaker plate. The lever arm spring is also backed up by buffer springs at each of its ends to relieve the strains that would otherwise cause fatigue.

The breaker plate is further equipped with a tapered concentric boss and key that fits into a female taper in the end of the armature shaft, and the entire mechanism is securely held in place by an insulated connecting screw that completes an electrical connection between the insulated breaker plate and the condenser plate, so that the connecting screw serves the double purpose of mechanically securing the interrupter to the armature

lation to the engine, the resulting spark can be adjusted to occur at different piston positions.

For the "H" armature type magneto, represented in the figure there are two cams; one for the positive spark and the other for the negative spark, and they are so located that for the "advanced" engine firing position the circuit will be interrupted just following the magnetic break between the trailing armature core tip and the field pole shoe tip it is leaving, while for the "retarded" engine firing position the interruption can be adjusted to occur as much as 30 deg. of armature motion later. A stop pin usually limits the motion of the interrupter housing to the firing range of the magneto.

The interrupter housing is held in its place upon the armature bearing plate flange by a post and spring means clamping against a cover over the end of the interrupter housing.

As further features of interest, not essential to the interrupter, but to the high tension system as a whole, a grounding brush and spring makes a direct electrical connection between the magneto frame and the rotating armature so as to prevent the high tension spark current from passing through the bearings every time a spark is delivered by the secondary circuit. In addition to this precaution, the annular bearings sometimes have their races insulated from the bearing plates by the use of fiber.

A second grounding brush is mounted in the interrupter plate to engage with the armature bearing plate of the frame. This brush serves as an auxiliary to the above-mentioned grounding brush and serves especially for installations in which a switch is employed to short circuit the interrupter for cutting off the ignition.

Interruption of Primary Circuit

The most important electrical function performed by the interrupter is to break the primary short circuit at a time when the energy generated and stored in the primary winding is such that a high tension spark will be produced in the secondary circuit. In order to make this break of the electrical circuit as

effective as possible, the separation that takes place between the contacts must be produced in a quick and decided manner, so that after the contacts have once separated, all the subsequent electrical action in the primary circuit will take place between the primary winding and the condenser.

To accomplish this feat, the pivoted arm type of interrupter shown in Fig. 1 has been developed to a high degree of perfection, it being maintained that the rigidity of the arm assures that the contacts will positively and quickly separate when the fiber bumper engages with the cams.

Fig. 2 is presented to show graphically the electrical phenomena of the energized primary circuit coincident to an interruption.

The lower curve, starting at the left, shows how the current is generated during a period of short circuit until it reaches about its maximum value at the instant of break. The upper curve shows that the voltage across the contacts during this period is zero.

If the interruption did not take place the current would flow as per the dotted line designated "uninterrupted current" and the voltage would, of course, remain zero.

But at the instant of break, two simultaneous results follow, first the current generation ceases and must drop toward zero, and second, the empty condenser which is

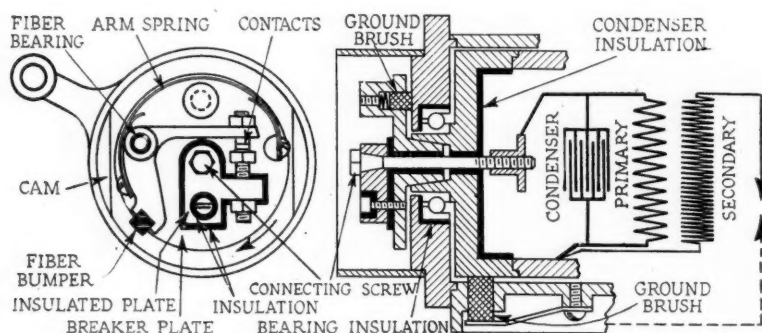


Fig. 1—Typical mechanical interrupter and its connections with magneto

and of electrically connecting the interrupter with the condenser.

A further electrical connection between the insulated primary winding terminal and the condenser plate ties the primary winding to the insulated breaker plate also.

The other side of the condenser and the other terminal of the primary winding are grounded to the armature core and thus are electrically connected to the breaker plate through the taper fit between the breaker plate and the armature shaft. From this arrangement it is very evident that when the interrupter contacts are together both the primary winding and the condenser are short circuited through the lever arm spring, the lever arm, the contacts and the connecting screw.

This short circuit allows the primary winding to generate and store energy with the rotation of the armature and keeps the condenser "empty" during the period of short circuit.

The cams which make possible the interruption of the circuit at the contact points, are mounted in a housing that is carried concentrically upon a flange projection of the armature bearing plate, and the housing is so adapted that it may be rocked on this dowel flange by means of a lever. With this adjustable breaker housing carrying the cams, it is evident that the time of circuit interruption can be changed to different armature positions and due to the fact that the armature is geared in timed re-

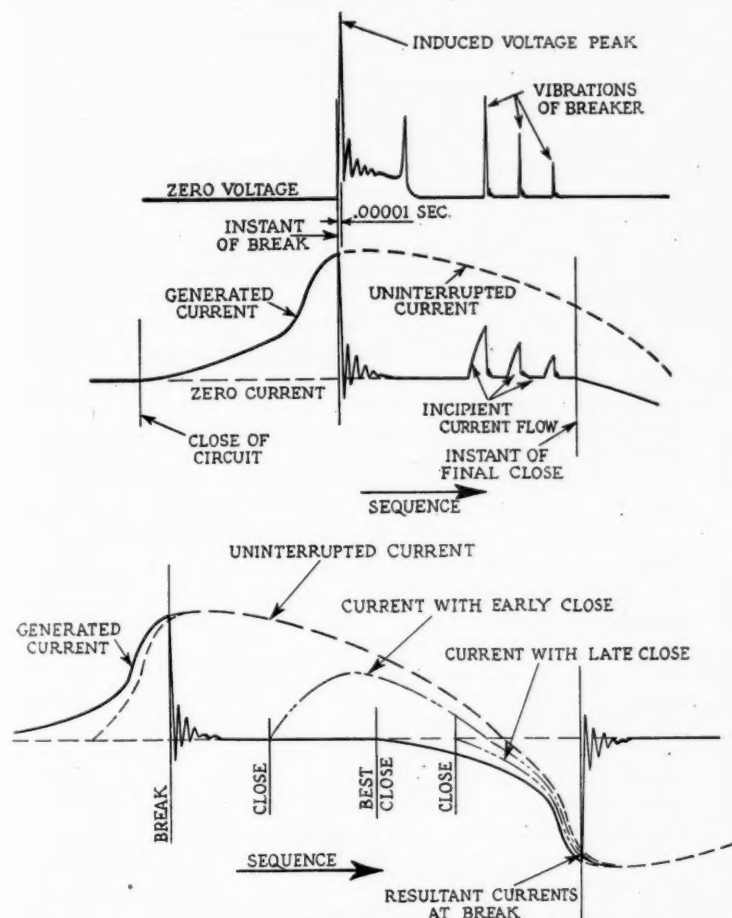


Fig. 2 (Upper)—Electrical phenomena accompanying break of primary circuit, including effect of vibrations
Fig. 4 (Lower)—Illustrating effect of time of make upon current values. (Magneto system)

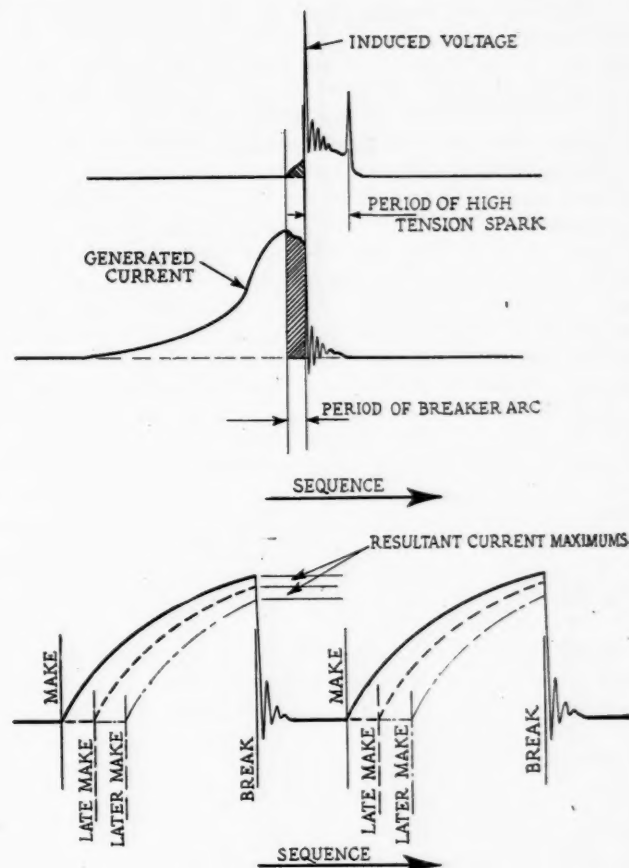


Fig. 3 (Upper)—Phenomena typical of arcing at contacts
Fig. 5 (Lower)—Effect of interrupter closing on primary current. (Battery system)

suddenly thrown into the circuit across the primary winding will start to absorb a charge of energy from the primary winding.

The combination of these two results is that the current generation in the primary suddenly ceases and the primary energy tending to enter the condenser causes the primary winding current to drop toward zero precipitously, inducing a very high voltage per turn in both the primary and secondary windings. This induced voltage is shown in Fig. 2.

It is this voltage that initiates the spark at the secondary circuit spark plug and permits the secondary winding to discharge most of the energy in the form of a high tension spark.

The balance of the energy will oscillate electrically between the primary winding and the condenser until it is dissipated in primary circuit losses.

The effect desired in a quick break of the circuit is that the current shall drop toward zero and the voltage induced rise toward its maximum value as quickly and as directly as possible, so as to keep the period of time designated in Fig. 2 by ".00001 second" as small as possible.

While this period of time under perfect conditions is controlled by the balance of the electrical circuits and not by the interrupter, certain faulty conditions such as arcing at the contacts or a hesitating interruption of the circuit can affect this period of time very materially. These conditions will be discussed subsequently.

At the instant that the contacts first separate, the condenser will start to take on a charge of energy at a very high rate and the current flow into the condenser will therefore be very high, perhaps ten times or more

the maximum winding current generated. The result is that this current will tend to take all the paths possible in getting to the condenser. These paths include the interrupter lever and its spring, which are intended to be its only path from the interrupter lever grounded contact to the breaker plate, and it is partly to prevent the rush of condenser charging current on the grounded side from flowing through the lever arm pivot and the cams, that the fiber bushing and the fiber bumper block are mounted in the interrupter. Fiber is also used at these places because of the excellent mechanical results obtained by a bearing between fiber and steel.

In some of the earliest types of magnetos, the practice was started of having a copper strip along with the interrupter arm spring to aid in taking care of this condenser charging current on the grounded side, but while this idea seemed to have considerable theoretical value, it was found by experience to be unnecessary.

Arcing at Interrupter Contacts

Following the interruption of the primary circuit, one of the most undesirable things that can happen is to have arcing at the interrupter contacts.

This arcing burns away the platinum contacts very rapidly when it is excessive, or it will also produce a coating such as an oxide on the contacts that will soon impair very much the operation of the system.

Some makers of magnetos advertise that a little arcing at the contacts is necessary to keep the contacts clean, but the writer believes the value of arcing in that direction rather questionable.

One of the principal functions of the condenser in a high tension ignition system is to prevent arcing by

handling all the energy that is not transferred to the secondary circuit, but even at best occasional arcing will occur. Continual arcing at the interrupter contacts is usually an indication of poorly balanced circuits or of a poor connection in the primary circuit.

Beside the evil effect of arcing upon the platinum contacts, this arcing when excessive also reduces the amount of energy that will be delivered to the high tension spark. This point is illustrated by Fig. 3.

Fig. 3 shows how the total period of sparking is divided between a period of breaker arc and a period of high tension spark, and shows that the high tension spark cannot begin to take place until after the primary circuit arc has ceased. Therefore if a large part of the energy available for a spark is spent in the breaker arc it must be very evident that the energy left for the high tension spark will be reduced that much. If you have ever watched a high tension magneto, on test, that would arc rather badly at times, you have perhaps noticed that the accompanying high tension spark was very poor. It is to explain this phenomena that Fig. 3 is presented. In Fig. 3 the shaded areas on the current and the induced voltage curves are components of the energy spent in the arc.

In addition to the evil effect of arcing upon the platinum contacts and the corresponding reduction of the high tension spark, arcing has still another detrimental effect upon the operation of the system. It seems that the amount of voltage that will be induced in the windings following the interruption of the primary circuit depends largely upon the amount of current flow in the primary winding just before break, that is the further the current has to drop toward zero following break the greater the induced voltage will be. During arcing, as shown by Fig. 3, there is a gradual fall of current so that when the condenser does get started, the resulting induced voltage peak will not be as great as it would had no arcing taken place.

When, as in some installations, the ignition system has all it can do under the best of conditions, it is very evident that arcing at the interrupter might cause the ignition to fail. The effect of arcing upon the voltage induced has a pronounced influence upon the slow speed performance of a magneto and in general it will be found that a magneto that arcs badly will not function at as slow a speed as it otherwise would.

Closing of Interrupter Contacts

While the breaking of the primary circuit is the important function performed by an interrupter, the circuit must close again to be ready for the next successive break, so that this closing or "making" of the short circuit is also important and has an important bearing upon the performance of the ignition system, whether magneto or battery system, especially at the higher speeds of operation.

To explain the importance of the phenomena of making the circuit, Fig. 4 is presented to illustrate what takes place in the case of magnetos.

In this figure the "uninterrupted" current and the "interrupted" current waves are superimposed in about their true relationship to each other.

The time of break of an interrupter is determined definitely by the position of the cams, but in most interrupters the time of "make" depends upon the relation of the reactionary forces of the lever arm to the arm spring force.

As the armature rotates and the interrupter lever arm is actuated by engagement with the cams, the arm receives a certain amount of throw and due to the inertia that the arm is bound to have the spring is unable to

bring the contacts to a close immediately on passing the cam. This throw increases as the speed of the armature rotation increases and the result is that the "make" of the circuit may occur 45, to 90 or more degrees of armature rotation following "break."

During the period of "open circuit" following the interruption of the primary circuit and the high tension spark delivery, there is bound to be some residual magnetic flux cutting across the windings, with the armature rotation, that will generate an electromotive force in the windings.

If the "make" occurs very early after break, when this e.m.f. is of some moment, current will again flow in the primary winding. If the spark just delivered was of positive polarity current then this current will also be of positive polarity and due to the inductance of the winding it will tend to linger in the circuit beyond the armature position of no flux change; namely, the horizontal armature position, just as the "uninterrupted" current is shown to do in Fig. 4. The result is that when the armature passes the horizontal position and starts to generate current of negative polarity, a certain amount of energy will be required to neutralize the lingering positive current before the useful negative energy can be stored in the primary winding ready for the next spark. Or if the make occurs very late, that is very far beyond the horizontal armature position, the current generated for the next successive spark will be late in getting started. In the event of either a very early or a very late make therefore, the result is that the current for the next successive spark will not reach as high a maximum value as it would if the make occurred at about the horizontal armature position. It is to illustrate this point particularly, in connection with early and late making of the circuit and the general effect upon the resulting current maximum that Fig. 4 is presented. The resultant current maximum of course has a direct bearing upon the amount of energy that will be delivered to the high tension spark.

It is practically impossible to control the position at which the interrupter contacts will "make" in the usual type of interrupter for the different speeds that the magneto is subject to, but it so happens that at the slower speeds the amount of "extra" energy that will be generated drops off along with the tendency of the contacts to close earlier, so that if the interrupter is designed for satisfactory closing of the circuit at the higher speeds desired it will tend to regulate itself automatically very well for the slower speeds.

In the case of battery and coil systems, the time of make is also an important consideration. The phenomena are illustrated in Fig. 5, where it is shown that for any particular frequency of interruptions, as measured by the period of time between breaks, the time required for the contacts to close following break has a material influence upon the maximum value that the current will attain during the period of closed circuit for any particular coil.

It must be borne in mind that the rate of energization of a coil depends upon the electrical circuit characteristics and is always practically of a constant nature, while in a magneto the rate of energization tends to increase with increased armature speeds within certain limits.

In the case of the battery system, it must be evident that as the frequency of interruptions increases with engine speed, the period between breaks grows shorter and at the same time the tendency is for the make to occur later and later after break as the interrupter speed increases, with the result that the period of closed circuit gradually shortens at both ends and the high ten-

sion spark energy must decrease with increased engine speed. For these reasons the battery and coil ignition system delivers its best spark at slow speeds and gradually falls off as the engine speeds up.

Vibration or Bouncing of Interrupter Arm

Another important consideration in connection with mechanical interrupters is that of vibration or bouncing of the lever arm in closing.

The usual interrupter closes its contacts under the influence of a spring and since the arm has inertia during its motion there will be a tendency for the contacts to rebound or vibrate before coming to a final close. This bouncing will produce a series of incipient current flow impulses each time the contacts come together, and a series of induced voltage peaks each time they bounce apart. Additional strain upon the secondary insulation results from these induced voltage peaks and the vibrations delay the time of final closing of the circuit.

The electrical phenomena, including both the current flow impulses and the induced voltage peaks, coincident to vibration of the interrupter lever arm are shown in the curves of Fig. 2.

The results of the official tests conducted by the National Advisory Committee for Aeronautics to determine the "Heat Energy of Various Ignition Systems" as set forth in Report No. 56 show that in all magneto ignition systems the spark heat increases with magneto speed up to a certain speed. Beyond this speed, the energy begins to drop off gradually with further speed increase and in some cases a second rise in the curves takes place for still higher speed. While no explanation of the depression in the spark out-put speed curve was given, the writer ventures the belief that this depression in the curves was caused by the vibration of the interrupter arm and its effect upon the closing of the contacts.

These vibrations will have a certain period in any particular case dependent upon the relation of the numerous forces at play on the arm during the action of the interrupter, and it is not unlikely that the speed at which the maximum depression occurred in the case cited was such that it brought the arm in tune for maximum vibration. Increase in speed beyond this point would reduce the vibration again and permit the magneto to build up an increased amount of energy with it.

While the forces at play upon an interrupter arm are numerous and the reduction of vibration in any particular interrupter is purely a matter of experiment, it is highly essential to the reduction of vibration that the interrupter arm have a good bearing fit upon its pivot as a loose fitting arm will be free to vibrate badly.

Welding of Contacts by Condenser

It was pointed out in connection with the closing of the interrupter contacts that, during the period of open circuit following the break of the circuit and the high tension spark delivery, a residue flux cuts across the winding and generating an e.m.f. therein.

Since the primary winding is connected on open circuit directly across the condenser, it is evident that this e.m.f. will tend to charge the condenser.

From this it follows that if the contacts close either very early or very late while the condenser is so charged, this charge will be suddenly dissipated at the contact points at the instant they close. Short circuiting a charged condenser is always accompanied by intense heat at the points of contact and tends to have a welding effect upon them. The phenomena is accompanied by a shower of very small sparks that fly in every di-

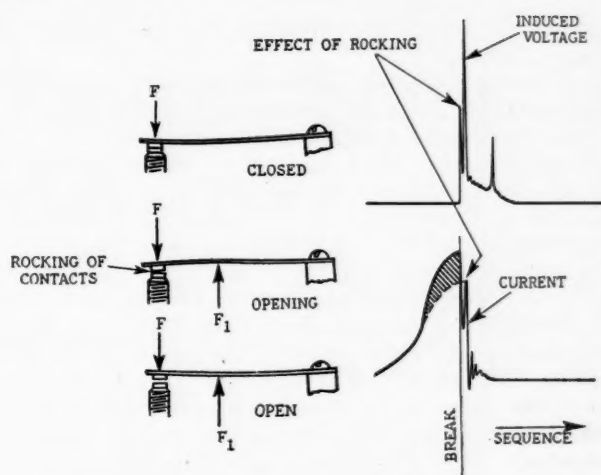


Fig. 6—Mechanical and electrical phenomena of simple spring type interrupter

rection when the contacts come together. When these sparks are seen it is a sign that the interrupter is closing either too early or too late. So that beside the advantageous effect upon the maximum current produced by having the contacts close at a time of zero e.m.f. in the windings, this is also the time when no welding action at the contacts can occur.

In battery ignition systems there is no period of zero voltage during open circuit, hence the contacts are always subject to the necessity of discharging the condenser at every make. On the other hand the condenser capacity required for battery systems is much less than that required by magnetos so that the welding effect is not a grave concern.

Contact Material

It has been shown that the interrupter contacts are liable to be subject to such electrical phenomena as arcing, welding and the conducting of generated current, that they are subject to mechanical impact and the heating and oxidization that naturally results. In order to stand up in service under these conditions, the contacts have to be made of the very best material obtainable. A platinum-iridium alloy, containing from 15 to 20 per cent iridium, has been found to be the best material for ignition system contacts. This alloy oxidizes very slowly under average conditions and thus remains a very good conductor for the generated current. It is also hard enough to withstand the mechanical impacts it is subject to and to resist the arcing and welding actions in a very satisfactory manner. Because of the expense attached to these contacts attempts have been made to use tungsten, but while it has given satisfaction in special cases its general use has not been adopted. Tungsten seems to oxidize more rapidly than does the platinum-iridium.

In connection with interrupter contacts it might be well to mention at this time that it is highly important that oil or other foreign matter be kept from getting onto the contacts as it prevents the two contacts from making a good metallic "make" of the circuit.

It is because of this danger that interrupters are equipped with oilless bearings and no oil is ever admitted to interrupters except by means of a wick for oiling the cams for the interrupter fiber bumper arm. This oil should be used very sparingly.

Rocking of Contacts

From the very beginning of the use of mechanical interrupters for high tension ignition systems, efforts have been made to simplify it mechanically by eliminating the breaker arm. This is accomplished by mounting

the grounded platinum contact point directly upon the spring.

Fig. 6 is representative of the earliest types employing this construction, but in this particular embodiment of the idea which has now become almost obsolete, certain troubles arose that the writer has attempted to point out by means of the illustration, and it is, perhaps, due to these troubles that this particular form of interrupter has become practically obsolete.

The spring was connected directly to the breaker plate by a screw about as shown and due to a slight bend downward exerted a force throughout its entire length that can be represented as having a useful value F holding the two contacts together.

When the cam, or any medium through which it acts begins to exert a force F_1 tending to lift the spring and consequently its contact away from the insulated contact, the very first result obtained by F_1 is a tendency to relieve the spring tension from the point of its application to the point of application of F , hence that part of the spring tended to straighten out. The result was that instead of the contact being lifted quickly away from the insulated contact, it rocked from a flat surface contact to an outer edge contact before it finally lifted to a complete break.

This "rocking" or hesitating break is equivalent to a "break-make-break" action that seriously interferes with the efficiency of the energy transformation and transfer in the windings which should start at the very instant of first break.

The effect of this rocking is shown graphically by the current and induced voltage curves shown in the figure. The current at break tends first to take a very sudden drop toward zero for the induction of the high voltage necessary to initiate the spark, but being, as it is, followed almost immediately by a closing of the circuit again, the induced voltage is checked momentarily before the necessary spark voltage value is reached, causing it to drop toward zero again until the final break occurs. The current, of course, can never recover during the extra "rocking" made and so the induced voltage that does finally initiate the spark cannot be produced as effectively as it would have been had the first break

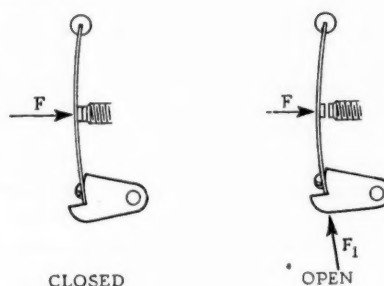


Fig. 7. Illustration of action giving parallel contact motion

Certain modifications have been incorporated into this general type, shown in Fig. 6, that have overcome its troubles very well.

Parallel Contact Action

Fig. 7 is presented to show an interesting type of interrupter action that produces a very effective break. In this interrupter the contact is mounted on the center of the spring, one end of which is connected to the breaker plate with a slight freedom, while the other end connects to an actuating arm. A slight bow of the spring tends to hold the contacts engaged and they may be opened by a cam exerting a force F_1 , as shown, that tends to further bow the spring against the force F .

A principal point of interest in connection with this action is that the force F_1 has to act through only about one-half the distance of contact separation resulting and a very quick separation of the contacts is obtained. Further it will be seen that the contacts open in an almost parallel relation to each other.

Parallel action of the contacts is a very desirable characteristic. It is not accompanied by a wearing of the contacts on one side as is liable to be the case in the lever arm type of breakers, so that when an adjustment of the contacts is made to take up wear, there is not the need for as much filing and dressing down of the contacts as is usually required. This is, of course, a very important item in the life of the contacts.

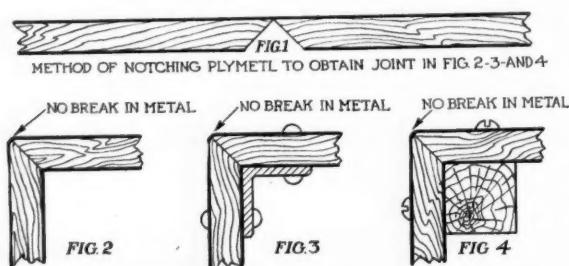
(To be continued)

Dashes and Body Panels of Metal Covered Veneer

A NEW material for automobile dashes and body panels is now being manufactured by cementing thin sheet metal faces to a relatively thick core of light-weight material. The sheet metal forms a smooth, impervious and durable surface. The core spaces the faces relatively far apart, making the material strong and stiff while still retaining lightness.

It is furnished from stock in panels 5/16 in. thick, with faces of black or galvanized sheet metal, No. 30 gage, and with planed wood veneer cores. It weighs about 1.8 lb. per sq. ft. and comes in 30 x 96 in. panels. It is claimed

for the material that it is five times as stiff as a 5/16-in. solid wood panel and eight times as stiff as sheet steel of No. 19 gage, which has the same weight. The elastic limit in bending is 75 in.-lb. per inch of width or about five times the elastic limit of No. 19 gage steel. Impact, shearing strength and fatigue tests have also been made by the manufacturers with satisfactory results. The core subjected to tests was made of fir wood veneer, planed. The illustration herewith shows three methods of making a right-angled joint with this material which is known as Plymetl and is manufactured by the Haskellite Mfg. Co.



Three methods of making right angle joints with Plymetl, a veneer covered with light sheet metal

FOR students a motorist desiring to gain information concerning all branches of automobile construction and operation, probably no better method of handling the subject could be desired than that of questions and answers. This is the method used by Victor W. Page in his "Questions and Answers Relating to Modern Automobile Design, Construction and Repair," of which a revised and enlarged edition has recently been issued.

The nature and character of Mr. Page's work is familiar to automotive engineers, so that a detail discussion of the new edition need not be given here.

Development and Present Status of German Airships

The tables shown in this article include all the German airships built up to the present time, while the article describes the technical successes and failures of the various types. The performance of the R-34 is compared with that of the German L-59 which made a trip to East Africa.

THE Tables of German Airships on the following pages include all German airships built to date with the exception of a few built prior to 1910, which would be classified under the heading of miscellaneous types. These have been omitted because of their relative unimportance, since they could neither be classed as successful nor did they exert any important influence on the development of German airships.

The development of the non-rigid German airship can best be traced through the Parseval types. Their development covered the period of years from 1906, when the experimental PV Type was placed in service, to 1917 when the PL-27 was constructed.

The Parseval series were all built to the patents of Major von Parseval by the Luft-Fahrzeug-Gesellschaft (L.F.G.) at Berlin. That they were successful is attested by the fact that the company secured orders from Austria, England, Italy, Japan and Russia. The PL 22, 23 and 24 were laid down but never completed, probably because the rigid type was better adapted to purposes of war and the utility of the small non-rigid airship was eliminated with the advent of the large rigid types.

Starting with the PL-14, all Parseval airships had envelopes with the Parseval patent trajectory band system of car suspensions which was a very efficient system of non-rigid construction. The PL-25 had a small girder extending fore and aft from the center of the ship about 60 ft., and with the PL-27 really comprised a semi-rigid airship, although the Germans classify it as non-rigid. Under the envelope of this ship there is a fore and aft keel with a walkway which extends nearly the complete length of the ship. Beneath this, but forward, is the navigator's car and immediately behind it is the first power car. About half way along the keel are two side power eggs similar to those used in the latter types of Zeppelin airships, and at almost the extreme aft end of the keel is located another power car. The keel walkway carried the gasoline tanks and the water ballast bags as in semi-rigid or rigid airships.

The semi-rigid airships were of two types, that with the keel incorporated in the envelope as in the last Parseval airship (PL-27), and that with the keel slung several yards below the envelope, as in the Gross-Basenach or "M" type.

The most important semi-rigid airships constructed were the "M" or military types built for the Prussian Army by the Prussian Army Airship Works and were mainly the design of two men, Major Gross of the Prussian Army, and Herr Basenach. They were evidently not much of a success, for the later type of Parseval airship was given preference over the military types. In the early types of semi-rigid airships, those with the suspended keel, the gas tanks were carried in the cars,

but in the later types with the keel incorporated in the bottom of the envelope, the gas tanks were placed in the rigid keel framework. This made it permissible to use lighter construction in the cars and utilize with slight modifications the existing keel framework, thereby effecting a saving in the structural weight of the airship.

The first rigid airship was constructed by David Schwartz in 1893 in Petrograd. It was composed of aluminum and was not sufficiently gas tight to be tested. However, in 1895 to 1897 he built in Berlin a new airship (47.5 m.) 155 ft. long (13.5 m.) 44.2 ft. in diameter, which had a total capacity of (3700 cu. m.) 130,500 cu. ft. The framework consisted of twelve rings and sixteen longitudinal aluminum girders and sheet aluminum was used for covering material. It was equipped with a Daimler engine developing 12 hp. at 480 r.p.m. The ship was inflated by using an interior bag, which, as soon as it was filled and the air had been totally displaced from the interior of the hull was torn up and pushed out through an aperture. This left the gas in direct contact with the aluminum envelope. The airship had three propellers, two on side brackets and the third between the gondola and the hull, and since it had no rudder, it was steered by this propeller arrangement. In its second flight on Nov. 3, 1897, the belting driving the propellers slipped off the pulleys and the helpless airship was dashed to the ground by a strong wind and wrecked.

The rigid airships were developed by two constructors, the Zeppelin Works and the Schütte-Lanz Company. Both types were composed of a rigid framework with a variable number of gas cells. In the Zeppelin type the rigid framework consists of longitudinal members running from stem to stern, and transverse members which run from longitudinal to longitudinal, around the ship, thus forming a ring. The material used for the construction is duralumin. In the first Schütte-Lanz airship the rigid framework was composed of diagonal members which ran spirally around the ship from stem to stern, and transverse rings as in the Zeppelin types. Too many difficulties in fabrication were encountered, however, and in the remainder of the Schütte-Lanz airships the girders run longitudinally and transversely as in the Zeppelin airships. The material used, however, in the Schütte-Lanz types was wood and all structural members were made of built-up wooden sections. When these ships were used by the navy it was found that the wood absorbed moisture and the airship became very heavy. In addition to this the glued joints opened up, but later through a new method of fabrication and chemical impregnation of the wood these difficulties were overcome. It is understood that at the time of the armistice

German Airships (Non-Rigid)

Miscellaneous Types

Airship Designation	Capacity, Cu. Ft.	Length, Feet	Diameter, Feet	Total Load, Pounds	Useful Load, Pounds	Useful Total, Per Cent	Engines, Number	Engines, Make	Engines, Total H.P.	Propellers		Speed, M. P. H.	Number of Passengers and Crew	Placed in Service	History	REMARKS
										Number	Material					
Clouth	65,000	138	27.8	4,400	.....	.....	1	Adler	50	2-2 Bladed	Wooden	19.0	4	1909	Keel girder type	Endurance, 10 hours
Siemens	475,000	394	44.3	32,300	.....	.....	4	Daimler	480	(2-4 Bladed	Steel	44.5	.....	Jan. 23, '11	(Rebuilt and dismantled)	Passenger car in center
Schuckert	353,000	246	55.7	24,200	.....	.....	2	N. A. G.	220	(4-2 Bladed	Fabric	22.5	6	Early 1912	Motor boat car	Engine cars in front and rear
Suchard																Built for Trans-Atlantic Flight Expedition

Parseval Types

PV	81,000	164	29.2	5,500	2,200	40.0	1	Daimler	85	1-4 Bladed	Fabric	27.0	6	May 26, '06		Experimental—enlarged to 99,000 cu. ft.
PL-1	120,000	197	30.8	7,600	2,850	37.5	1	Daimler	85	1-4 Bladed	Fabric	27.0	6 to 8	Sept. 21, '09		Rebuilt PV—purchased by Imperial Aero Club for excursions. Dismantled 1911
PL-2	141,000	197	34.1	9,600	3,500	36.5	1	Daimler	85	1-4 Bladed	Fabric	28.0	6	Aug. 13, '08		P-I of Prussian army. Destroyed by storm at Grünwald Sept. 16, 1908
PL-3	233,000	229	40.4	15,800	4,100	27.9	2	N. A. G.	220	1-4 Bladed	Fabric	32.0	12 to 16	Feb. 18, '09		P-II of Prussian army. Destroyed by storm May 16, 1911
PL-4	89,000	164	28.2	6,050	2,200	36.4	1	Austro Daimler	70	1-3 Bladed	Fabric	28.0	5	1909		Built in Austria for Austrian army
PL-5	51,000	131	26.3	3,460	1,320	38.1	1	Daimler	25	1-3 Bladed	Fabric	20.0	4	Dec. 8, '09		Sporting airship. Destroyed by fire June 16, 1911
PL-6	240,000	229	40.4	16,300	6,600	40.5	2	N. A. G.	220	2-4 Bladed	Fabric	33.5	12 to 16	Jan. 30, '10		Commercial airship "Stollwerck" later enlarged to 282,000 cu. ft.
PL-7	268,000	236	45.9	18,200	4,840	26.6	2	N. A. G.	220	2-4 Bladed	Fabric	36.5	12 to 16	Oct. 30, '10		Russian army airship
PL-8	290,000	253	50.9	19,700	6,160	31.3	2	Maybach	340	2-4 Bladed	Plate steel	41.8	.....	Dec. 24, '12		Started 1910 but building interrupted. Replaced P-II of Prussian army
PL-9	60,000	131	26.3	4,080	2,420	59.4	1	N. A. G.	50	1-2 Bladed	Wooden	21.6	4	Oct. 10, '10		Sporting airship. Enlarged to 78,000 cu. ft. in 1912
PL-11	353,000	276	50.9	24,000	6,780	28.2	2	Körting	400	2-4 Bladed	Plate steel	40.2	7 to 12	Dec. 13, '11		P-III of Prussian army
PL-12	282,000	269	45.9	19,200	6,600	34.4	2	N. A. G.	220	2-4 Bladed	Plate steel	33.5	12 to 16	May 11, '12		Commercial airship "Charlotte." Used for excursions
PL-13	282,000	259	47.6	19,200	4,840	25.2	2	Maybach	300	2-4 Bladed	Plate steel	41.2	7	Apr. 3, '12		Built for Japanese army
PL-14	353,000	269	52.5	24,000	.....	.....	2	Maybach	360	2-4 Bladed	Plate steel	41.3	.....	Feb. 27, '13		Built for Russian army
PL-16	353,000	308	50.9	24,000	7,480	31.2	2	Maybach	360	2-4 Bladed	Wooden	48.0	.....	Aug., 1914		P-IV of Prussian army
PL-17	353,000	279	52.5	24,000	6,160	25.7	2	Maybach	340	2-4 Bladed	Plate steel	40.2	.....	Sept. 13, '12		Built for Italian army
PL-18	311,000	275	49.2	21,200	6,160	29.0	2	Maybach	360	2-4 Bladed	Plate steel	40.2	.....	Apr. 23, '13		Built for Great Britain. Assembled in England
PL-19	363,000	308	51.2	24,700	7,270	29.4	2	Maybach	360	2-4 Bladed	Wooden	47.8	.....	Summer '14		Ordered by Great Britain. Used by German navy during World War. Overloaded, fell into sea. Destroyed by Russian warship
PL-21	353,000	302	49.2	24,000	.....	.....	2	Maybach	360	2-4 Bladed	Wooden	47.5	.....	.....		Built for Great Britain. Assembled in England
PL-25	470,000	369	53.8	32,000	13,200	41.2	2	Maybach	420	2-4 Bladed	Wooden	43.5	.....	Jan. 1915		Had gun mount on top. Made over 300 voyages. Built for German navy
PL-26	1,060,000	512	62.7	72,000	About 35,200	48.9	4	Maybach	840	4-2 Bladed	Wooden	50.5	.....	Oct. 26, '15		Built for German navy. Burned in shed Nov. 19, 1915 at Bittfeld
PL-27	1,100,000	518	64.3	74,700	39,600	53.0	4	Maybach	960	4-2 Bladed	Wooden	56.0	.....	Mar. 8, '17		Built for German navy. Cars similar to rigid cars. Geared propellers
PL-22-23-24	Never Completed															

Built by Luft-Fahrzeug-Gesellschaft ("L. F. G.") Berlin.
Built to the patents of Major von Parseval.

German Airships (Semi-Rigid)

Miscellaneous Types

Ruthenberg I	42,000	131	21.3	2,860	.....	.....	1	Benz	24	1-4 Bladed	Plate steel	22.4	3	Sept. 1909	Keel girder type	Touring airship
Ruthenberg II	60,000	151	24.3	4,080	.....	.....	1	Fiat	75	1-4 Bladed	Plate steel	28.0	.....	Early 1911		Excursion airship. Wrecked June 1, 1911 while landing
Veeh	247,000	249	43.0	16,800	.....	.....	2	Schneeweiss	180	4-2 Bladed	Wooden	35.0	.....	Oct. 1913	Keel girder type	Dismantled after forced landing. Cars built in keel
Erseloh	102,000	174	32.8	6,950	.....	.....	1	Benz	125	1-2 Bladed	Wooden	30.0	5	Oct. 1909		Exploded on July 13, 1910 at high altitude. Erseloh killed

Military Types

MV	63,000	131	26.9	4,280	1,030	24.1	1	Gaggenau	24	2-3 Bladed	Metal	20.0	.....	May 7, '07		July 23, 1907 flew 7 hours; Aug. 28, 8 hours. Not satisfactory, rebuilt
M-I	176,000	215	36.4	12,000	3,000	25.0	2	Körting	150	2-3 Bladed	Metal	28.7	.....	June 30, '08		Sept. 1908 flew 13 hours (282 KM.)
Replaced M-I	194,000	235	39.3	13,200	3,640	27.6	2	Körting	150	2-2 Bladed	Wooden	28.1	.....	Feb. 26, '13		Cars suspended low
M-II	176,000	215	36.4	12,000	3,000	25.0	2	Körting	150	2-3 Bladed	Metal	28.7	.....	Apr. 26, '09		Aug. 4, 1909 flew 16 hours (460 KM.)
Replaced M-II	198,000	237	39.7	13,500	3,740	27.7	2	Körting	150	2-3 Bladed	Metal	28.0	.....	Aug. 12, '11		Cars suspended low
M-III	275,000	267	42.6	18,700	5,350	28.6	4	Körting	300	2-4 Bladed	Wooden	36.7	.....	Dec. 31, '09		Destroyed by fire Oct. 10, 1911 in Tegel shed. Fastest airship 1909-10
Replaced M-III	318,000	274	42.6	21,600	6,160	28.5	4	Körting	300	2-2 Bladed	Wooden	42.2	.....	Aug. 1912		Cars suspended low
M-IV	390,000	317	45.9	26,500	5,940	22.4	2	Körting	400	4-4 Bladed	Wooden	38.0	.....	Mar. 11, '11		2 gondolas. Cars suspended low
Replaced M-IV	475,000	323	50.2	32,300	7,050	21.8	3	Maybach	480	(2-4 Bladed	Wooden	51.2	.....	Aug. 11 '13		Cars built in keel. Gas tanks suspended in keel
Rebuilt replaced M-IV	687,000	396	52.8	46,700	15,400	33.0	3	Maybach	480	(2-4 Bladed	Wooden	50.3	.....	Sept. 7, '14		Largest airship built to date. Rebuilt to increase useful load

Built by the Prussian Army Airship Works to the designs of Major Gross and Herr Basenach.

the Schütte-Lanz Company was preparing to use duralumin instead of wood for the construction of their airships.

It should also be noted from the tables that, while using various types of engines in the early days, each series finally adopted Maybach engines. This is indeed a wonderful tribute to that engine. Its weight per horsepower is considerably heavier than most aviation engines, but the Germans seem to have neglected that characteristic and demanded primarily reliability which, after all, is the first requirement that should be considered in aviation engines. From the data available it

appears that only two airships, the LZ-24 (L-3) and the LZ-59 (L-20) were lost due to engine failure.

Curves

The curves plotted show at a glance the complete development of the rigid airship.

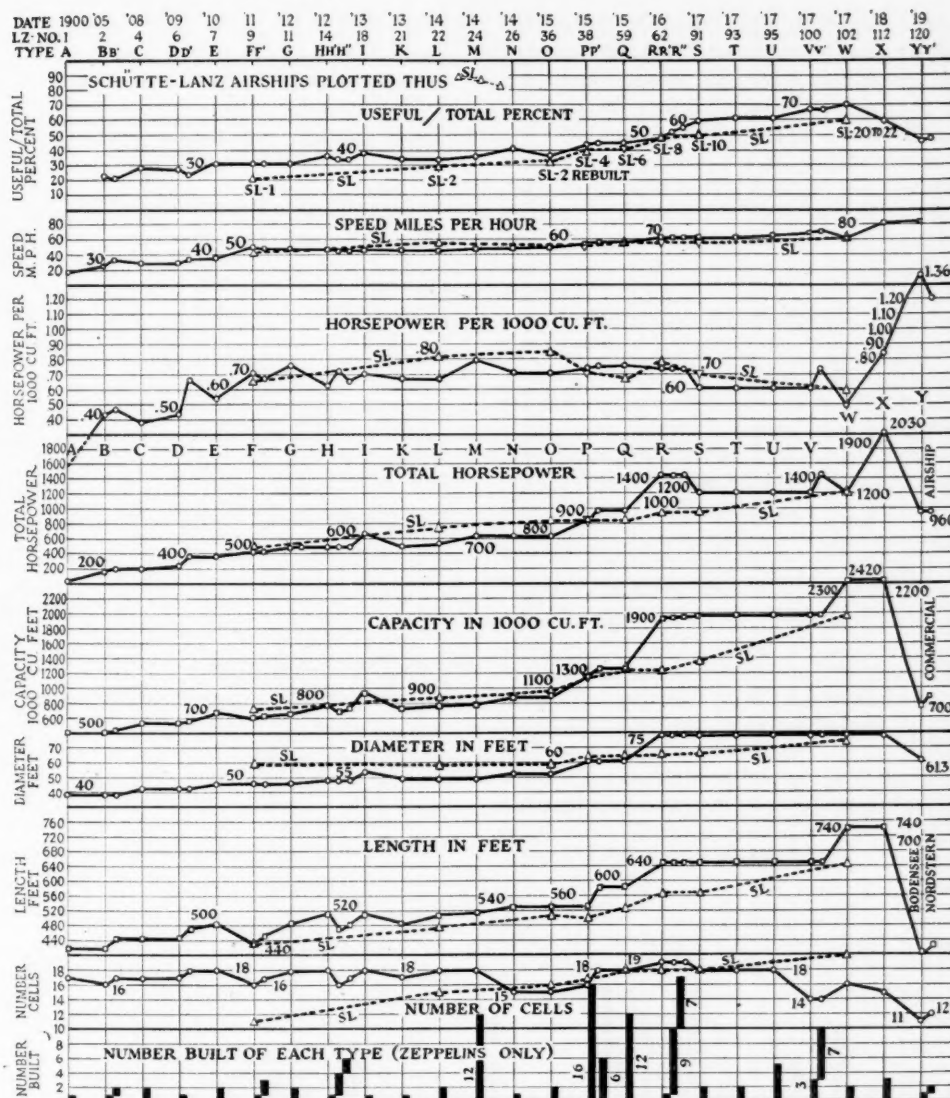
The points for the Schütte-Lanz curves are inclosed in triangles and the curves are light dotted lines. It is evident that the Schütte-Lanz airships followed the Zeppelin types and that the latter were the more important. For that reason the following comments will only refer to the Zeppelin types. (Points shown on curves as

squares and circles, curves are heavy full lines.)

At the extreme top we have the year in which the first airship of a particular type appeared, and next the LZ number of that ship. In the third heading are given the type letters arbitrarily assigned to the various classes of ships. Where several types have included in them airships which have different characteristics, these have been plotted separately on each curve (see H, H', H"; P, P'; and R, R', R"). For instance, the airships H, H' and H" are all of the same particular letter type, but since their characteristics varied and showed development within the type, it was necessary to plot them separately, as shown on each curve.

The first curve covers the percentage of useful load to total load and the figure shows an improvement from 20 per cent in 1900 to almost 70 per cent at the close of the war. In the second curve, the speed rose from 20 to 82.8 miles per hour. More than half of this increase was obtained in the period of 1914 to 1918.

The curve showing horsepower per 1000 cu. ft. (an arbitrary relation for purposes of comparison) indicates that the first Zeppelin was considerably underpowered, having only .07 hp. per 1000 cu. ft., whereas .7 hp. per 1000 cu. ft. appears to be an average figure. The influence of



Curves Showing Characteristics of German Airships (Zeppelin Types)

German Schütte-Lanz Airships (Rigid)

Building Number	Building Shed	Class	Owned by	Capacity Cu. Ft.	Number of Gas Cells	Length, Ft.	Diameter, Ft.	Total Load, Pounds	Useful Load, at 60-70 Mm Pounds	Useful Total, Per Cent	Engines, No.	Engines, Make	Engines H.P.	Engines, Total H. P.	Speed, M. P. H.	Date First Flight	Placed Out of Service	Life, Months	REMARKS	
SL-1	Rheinau	SL-1	Schütte Lanz Army	724,000	11	430	60.3	49,200	9,900	20.1	2	Mercedes	240	480	44.0	Oct. 17, '11	July 17, '13	21	Destroyed by storm at Eipel	
SL-2 Rbht.	Rheinau	SL-2	Army	883,000	15	473	59.7	60,000	17,600	29.3	4	Maybach	180	720	55.0	Feb. 28, '14				
SL-2	Rheinau	SL-2	Army	968,000	16	512	59.7	65,800	23,000	34.9	4	Maybach	210	840	52.5	Jan. 10, '16			22.5	Wrecked in storm at Luckenwalde
SL-3	Rheinau	SL-3	Navy	1,144,000	17	503	64.8	77,800	29,000	37.3	4	Maybach	210	840	52.5	Feb. 4, '15	May 1, '16	15	Wrecked in Baltic sea	
SL-4	Sandhofen	SL-4	Navy	1,144,000	17	503	64.8	77,800	30,700	39.4	4	Maybach	210	840	53.0	Apr. 25, '15	Dec. 15, '15	8.3	Destroyed by storm in Seddin shed	
SL-5	Darnstadt	SL-5	Army	1,144,000	17	503	64.8	77,800	31,400	40.4	4	Maybach	210	840	51.5	June '15	July 5, '15	1	Forced landing at Giessen. Torn loose in storm and wrecked	
SL-6	Leipzig	SL-6	Navy	1,240,000	18	532	64.8	84,500	34,800	41.2	4	Maybach	210	840	57.5	Sept. 19, '15	Nov. 18, '15	2	Fell burning at Seddin (Stolp)	
SL-7	Rheinau	SL-7	Army	1,240,000	18	532	64.8	84,500	34,200	40.5	4	Maybach	210	840	56.0	Sept. 3, '15	Mar. 6, '17	18	Dismantled in Jüterbog shed after curtailment of army airship operations	
SL-8	Leipzig	SL-8	Navy	1,240,000	18	572	66.0	84,500	41,100	48.6	4	Maybach	240	960	57.5	Mar. 30, '16	Nov. 20, '17	19.7	Dismantled in Seddin shed	
SL-9	Leipzig	SL-9	Navy	1,240,000	18	572	66.0	84,500	43,600	51.6	4	Maybach	240	960	57.5	May 24, '16	Mar. 30, '17	10.2	Fell burning in Baltic sea	
SL-10	Rheinau	SL-10	Army	1,370,000	19	572	66.0	93,300	46,200	49.5	4	Maybach	240	960	56.0	May 17, '16	July 28, '16	2.3	Disappeared in Black sea	
SL-11	Leipzig	SL-11	Army	1,370,000	19	572	66.0	93,300	About 46,200	49.5	4	Maybach	240	960	57.0	Aug. 2, '16	Sept. 3, '16	1	Shot down in attack on London	
SL-12	Zeesen	SL-12	Navy	1,370,000	19	572	66.0	93,300	45,800	49.1	4	Maybach	240	960	53.5	Nov. 9, '16	Dec. 28, '16	1.7	Wrecked at Ahlhorn	
SL-13	Leipzig	SL-13	Army	1,370,000	19	572	66.0	93,300	44,000	47.2	4	Maybach	240	960	56.0	Oct. 19, '16	Feb. 8, '17	3.7	Burned in Leipzig shed	
SL-14	Rheinau	SL-14	Navy	1,370,000	19	572	66.0	93,300	45,100	48.4	4	Maybach	240	960	56.0	Aug. 23, '16	May 11, '17	8.5	Damaged in hard landing and dismantled at Wainoden	
SL-15	Rheinau	SL-15	Army	1,370,000	19	572	66.0	93,300	45,100	48.4	4	Maybach	240	960	56.0	Nov. 9, '16	Summer '17	8	Dismantled in Sandhofen shed after curtailment of army airship operations	
SL-16	Leipzig	E-9	Army	1,370,000	19	572	66.0	93,300	45,100	48.4	4	Maybach	240	960	56.0	Jan. 18, '17	Summer '17	7	Dismantled in shed at Cologne	
SL-17	Zeesen	E-10	Army	1,370,000	19	572	66.0	93,300	45,100	48.4	4	Maybach	240	960	56.0	Mar. 22, '17	Summer '17	4	Dismantled in Allenstern shed	
SL-18	Leipzig	E-11	Army	1,370,000	19	572	66.0	93,300	4	Maybach	240	960	Feb. 8, '17	Framework destroyed by fire in Leipzig shed while being built
SL-19	Leipzig	E-12	Army	1,370,000	19	572	66.0	93,300	4	Maybach	240	960	Building stopped due to damage to Leipzig shed by fire on Jan. 8, 1917
SL-20	Rheinau	SL-20	Navy	1,978,000	20	650	75.2	134,400	77,700	57.8	5	Maybach	240	1200	64.0	Sept. 10, '17	Jan. 5, '18	4	Burned in Ahlhorn shed	
SL-21	Zeesen	F-2	Army	1,978,000	20	650	75.2	134,400	78,000	58.0	5	Maybach	240	1200	64.0	Not Obtained	Nov. 26, '17	Feb. '18	2.5	Dismantled in Zeesen shed
SL-22	Rheinau	SL-22	Navy	1,978,000	20	650	75.2	134,400	.....	.....	5	Maybach	240	1200	64.0	June 5, '18	June '20	24	Dismantled in Jüterbog shed

German Zeppelin

the horsepower per 1000 cu. ft. on the speed curve is shown by the parallel fluctuations of each curve. Comparing types S, T, U and V with type R, it is noted that the hp. per 1000 cu. ft. fell from .742 hp. to .610 hp. per 1000 cu. ft., whereas the speed remained practically constant or even advanced. (R = 62.2, S = 60.3, T = 60.3, U = 66.0, V = 67.0 miles per hour.) This would indicate a better aerodynamical form in these later ships. The next curve is for total horsepower and this curve parallels more or less the following one, capacity in thousands of cu. ft.

The diameter curve shows few changes, mainly because of the stress of wartime production, since a change in diameter probably meant the scrapping of a considerable amount of dies and tools. This supposition appears to be borne out by the fact that in the commercial airship Bodensee, which, of course, is smaller than those produced at the end of the war, the Zeppelin designers returned to a diameter of 61.3 ft., which had been used on the 34 airships of the P and Q types. The next curve is for length and shows, as does the diameter curve, a steady increase up to the close of the war.

The curve showing the number of cells illustrates perhaps best the method of the Zeppelin engineers in the development of their airships. The method obviously was to construct a given type of airship, and when all information had been gained from it, cut it in two, insert an extra gas cell, and experiment with the lengthened ship. The next step was a redesign, either keeping the same number of gas cells or reducing them, and at the same time increasing slightly the length of ship and the horsepower, and, less frequently, increasing the diameter. The new product then is used exactly like its predecessor, and gradually better constructional features are developed and incorporated. The last graph indicates clearly the numbers of each type built, those built before the war, the successful war types M, P, Q, R and V and the experimental war types, of which only a few were built.

Type Y is interesting because it is the commercial airship Bodensee and has incorporated in it the experience of twenty years of airship building. Commercial transportation was financially successful in Germany before the war, since four airships made 761 flights for a total of 1713 hours, traveling 95,848 miles, carrying 13,917 persons in the period from 1910 to 1912. The improvement in the Bodensee airship of 705,000 cu. ft. over type E, a ship of nearly the same size, is no-

Bldg. Number	Building Shed	History	Class	Owned by	Capacity cu. ft.	No. of cells	Lgth. ft.	Dia. ft.	Total Load lbs.	Useful Load (0-760mm) lbs.	Useful Total %	Power Cars No.	Engines No.
LZ-1*	Manzell			Zeppelin	400,000	17	420	38.2	27,200			2	2
LZ-2*	Manzell			Zeppelin	400,000	16	420	38.2	27,200	About 6,000	22.1	2	2
LZ-3	Manzell			Zeppelin	400,000	16	420	38.2	27,200	6,000	22.1	2	2
LZ-3	Manzell	Rebuilt	Z-I	Army	430,000	17	446	38.2	29,200	6,000	20.5	2	2
LZ-3	Manzell	Control surfaces rebuilt	Z-I	Army	430,000	17	446	38.2	29,200	6,000	20.5	2	2
LZ-4*	Manzell			Zeppelin	530,000	17	446	42.7	36,000	About 10,000	27.8	2	2
LZ-5	Manzell		Z-II	Army	530,000	17	446	42.7	36,000	10,000	27.8	2	2
LZ-6*	Friedrichshafen			Zeppelin	530,000	17	446	42.7	36,000	10,000	27.8	2	2
LZ-6	Friedrichshafen	Rebuilt		Delag	562,000	18	473	42.7	38,200	About 8,800	23.0	2	3
LZ-7*	Friedrichshafen		Deutschland	Delag	680,000	18	486	45.9	46,500	About 14,300	30.7	2	3
LZ-8	Friedrichshafen	Replaced LZ-7	Deutschland	Delag	680,000	18	486	45.9	46,500	14,300	30.7	2	3
LZ-9*	Friedrichshafen		Z-II	Army	592,000	16	433	45.9	40,200			2	3
LZ-9	Friedrichshafen	Rebuilt	Z-II	Army	628,000	17	459	45.9	42,700	About 13,200	30.9	2	3
LZ-10	Friedrichshafen		Schwaben	Delag	628,000	17	459	45.9	42,700	About 13,200	30.9	2	3
LZ-11*	Friedrichshafen		Viktoria-luise	Delag	658,000	18	486	45.9	44,700	About 13,600	30.5	2	3
LZ-12	Friedrichshafen		Z-III	Army	628,000	17	459	45.9	42,700	13,200	30.9	2	3
LZ-13	Friedrichshafen		Hansa	Delag	658,000	18	486	45.9	44,700	13,600	30.5	2	3
LZ-14*	Friedrichshafen		L-I	Navy	790,000	18	518	48.7	53,700	18,900	35.2	2	3
LZ-15	Friedrichshafen	Replaced Z-I (LZ-3)	Z-I	Army	686,000	16	466	48.7	46,600	15,500	33.3	2	3
LZ-16	Friedrichshafen		Z-IV	Army	686,000	16	466	48.7	46,600	15,400	33.0	2	3
LZ-17	Friedrichshafen		Sachsen	Delag	686,000	16	459	48.7	46,600	About 15,400	33.0	2	3
LZ-17	Friedrichshafen	Length increased	Sachsen	Delag	735,000	17	486	48.7	50,000	About 16,500	33.0	2	3
LZ-18*	Friedrichshafen		L-2	Navy	950,000	18	518	54.4	64,500	24,200	37.5	3	4
LZ-19	Friedrichshafen	Replaced Z-I (LZ-15)	Z-I	Army	686,000	16	459	48.7	46,600	15,400	33.0	2	3
LZ-20	Friedrichshafen		Z-V	Army	686,000	16	459	48.7	46,600	15,400	33.0	2	3
LZ-20	Friedrichshafen	Length increased	Z-V	Army	735,000	17	486	48.7	50,000	16,300	32.6	2	3
LZ-21*	Friedrichshafen		Z-VI	Army	735,000	17	486	48.7	50,000	16,500	33.0	2	3
LZ-22*	Friedrichshafen		Z-VII	Army	780,000	18	512	48.7	53,000	17,600	33.2	2	3
LZ-23	Friedrichshafen		Z-VIII	Army	780,000	18	512	48.7	53,000	17,600	33.2	2	3
LZ-24*	Friedrichshafen		L-3	Navy	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-25	Friedrichshafen		Z-IX	Army	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-26*	Frankfurt am Main		Z-XII	Army	880,000	15	529	52.4	60,000	24,200	40.3	2	3
LZ-27	Friedrichshafen		L-4	Navy	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-28	Friedrichshafen		L-5	Navy	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-29	Friedrichshafen		Z-X	Army	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-30	Potsdam		Z-XI	Army	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-31	Friedrichshafen		L-6	Navy	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-32	Friedrichshafen		L-7	Navy	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-33	Friedrichshafen		L-8	Navy	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-34	Potsdam		LZ-34	Army	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-35	Friedrichshafen		LZ-35	Army	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-36*	Friedrichshafen		L-9	Navy	880,000	15	530	52.4	60,000	22,000	36.7	2	3
LZ-37	Potsdam		LZ-37	Army	792,000	18	518	48.7	53,800	19,100	35.5	2	3
LZ-38*	Friedrichshafen		LZ-38	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-39	Friedrichshafen		LZ-39	Army	880,000	15	530	52.4	60,000	About 22,000	36.7	2	3
LZ-40	Friedrichshafen		L-10	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-41	Loewenthal		L-11	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-42	Potsdam		LZ-72	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-43	Friedrichshafen		L-12	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-44	Loewenthal		LZ-74	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-45	Friedrichshafen		L-13	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-46	Loewenthal		L-14	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-47	Friedrichshafen		LZ-77	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-48	Loewenthal		L-15	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4

*First airship of its type. Delag-Deutsche Luftschiffahrt Aktien Gesellschaft, Frankfurt a. M.

Airships (Rigid)

Engines Type	En- gines H. P.	Total H. P.	Propellers No. & Material	Spd mph	Date First Flight	Placed Out of Service	Life Mths	Type De- velop- ment	REMARKS
Daimler	14.7	29.4	4LZ Aluminum blade	18.0	July 2, 1900	Early 1901	7±	A	Dismantled in shed
Daimler	85	170	4LZ Aluminum blade	24.5	Nov. 30, '05	Jan. 17, 1906	2	B	Destroyed by storm at Kiesslegg (Allgäu) after forced landing
Daimler	85	170	4LZ aluminum blade	24.5	Oct. 9, '06			B	Became obsolete, dismantled in Metz shed
Daimler	100	200	4LZ aluminum blade	27.3		Autumn 1913		B	
Daimler	100	200	4LZ aluminum blade	33.5				B	
Daimler	100	200	4LZ aluminum blade	28.0	June 20, '08	Aug. 5, '08	2—	C	Forced landing at Echterdingen. Later burned up
Daimler	100	200	4LZ aluminum blade	28.0	May 26, '09	Apr. 25, '10	11	C	Forced landing at Weilburg. Carried away and wrecked by storm
Daimler	115	230	4LZ aluminum blade	29.0	Aug. 25, '09			D	Destroyed by fire in Badenoes shed
2 Daimler	2-115	370	4LZ aluminum blade	34.5	Sept. 14, '10			D	
1 Maybach	1-140	360	4LZ aluminum blade	35.7	June 19, '10	June 28, '10	0.3	E	Wrecked at Wellendorf (Teutoburgerwald)
Daimler	120	360	4LZ aluminum blade	35.7	Mar. 30, '11	May 16, '11	1.5	E	Destroyed while bringing out of Düsseldorf shed
Maybach	140	420	4LZ aluminum blade	48.5	Oct. 2, '11			F	Became obsolete, dismantled in Gotha shed
Maybach	140	420	4LZ aluminum blade	47.0	Aug. 1, '14			F	
Maybach	140	420	4LZ aluminum blade	47.0	June 26, '11	June 28, '12	12	F	Destroyed by fire at Düsseldorf
Maybach	140	420	4LZ aluminum blade	47.0	Feb. 14, '12	Autumn 1915	32	G	Destroyed while being put in Liegnitz shed
Maybach	140	420	4LZ aluminum blade	47.0	Apr. 25, '12	Summer 1914	27	F	Became obsolete, dismantled in Metz shed
Maybach	165	495	4LZ aluminum blade	47.0	Ju'y 30, '12	Summer 1916	48	G	Became obsolete, dismantled in Johannishall shed
Maybach	165	495	4LZ aluminum blade	47.4	Oct. 7, '12	Sept. 9, '13	11	H	Wrecked at Heligoland (Crew 21, endurance 31 hrs.)
Maybach	165	495	4LZ aluminum blade	45.8	Jan. 16, '13	Mar. 19, '13	2	H	Destroyed by storm at Karlsruhe after forced landing
Maybach	165	495	4LZ aluminum blade	46.7	Mar. 14, '13	Autumn 1916	43	H	Became obsolete, dismantled in Jüterbog shed
Maybach	165	495	4LZ aluminum blade	47.0	May 3, '13			H	Became obsolete, dismantled in Dören shed. (4 side bracket propellers.)
Maybach	165	495	4LZ aluminum blade	44.7	Sept. 9, '13	Oct. 17, '13	1	I	Caught fire during flight. Totally destroyed at Johannishall. (Crew 17, passengers 11, all killed)
Maybach	165	495	4LZ aluminum blade	46.6	June 6, '13	June 13, '14	12	H	Wrecked at Diedenhofen after forced landing
Maybach	165	495	4LZ aluminum blade	45.8	July 8, '13			H	Hit by gun fire and wrecked at Lipowitz (Mylawa)
Maybach	165	495	4LZ aluminum blade	44.7	Aug. 27, '14			H	
Maybach	165	495	4LZ aluminum blade	45.4	Nov. 10, '13	Aug. 6, '14	9	K	Hit by gun fire over Lüttich, wrecked at Cöln
Maybach	175	525	4LZ aluminum blade	45.8	Jan. 8, '14	Aug. 23, '14	7.5	L	Hit by gun fire on special flight. Wrecked at St. Quirin
Maybach	175	525	4LZ aluminum blade	45.2	Feb. 21, '14	Aug. 23, '14	6	L	Hit by gun fire on special flight. Wrecked at Badonvillers
Maybach	210	630	4LZ aluminum blade	48.0	May 11, '14	Feb. 17, '15	9	M	Engines failed, wrecked during storm at Fand coast (Monoplane rudder)
Maybach	210	630	4LZ aluminum blade	47.8	July 29, '14	Oct. 8, '14	2	M	Destroyed by English aviators in Düsseldorf shed
Maybach	210	630	3LZ aluminum later 3 Lorenzen wood	49.6	Dec. 14, '14	Aug. 8, '17	32	N	Dismantled in Jüterbog shed after abandonment of use of airships by army. (Spur gear drive).
Maybach	210	630	4LZ aluminum	48.0	Aug. 28, '13	Feb. 17, '15	17.5	M	Driven by storm to Denmark, wrecked at Borumose
Maybach	210	630	4LZ aluminum	48.0	Sept. 22, '13	Aug. 6, '15	23	M	Hit by gun fire, wrecked at Mitau
Maybach	210	630	4LZ aluminum	49.2	Oct. 13, '14	May 21, '15	7	M	Hit by gun fire in attack on Paris, wrecked at St. Quentin
Maybach	210	630	4LZ aluminum	49.2	Nov. 11, '14	May 20, '15	6	M	Wrecked and burned while bringing out of Posen shed
Maybach	210	630	4LZ aluminum	49.2	Nov. 3, '14	Sept. 19, '16	22.5	M	Burned in Fuhlsbüttel shed
Maybach	210	630	4LZ aluminum	49.2	Nov. 20, '14	May 4, '16	17.5	M	Shot down at Horns Reef while on special flight.
Maybach	210	630	4LZ aluminum	49.2	Dec. 17, '14	Mar. 5, '15	2.7	M	Hit by gun fire and wrecked at Tirmont
Maybach	210	630	4LZ aluminum	49.2	Jan. 6, '15	May 21, '15	4.5	M	Hit by gunfire in attack on Kovno, forced landing in East Prussia and burned.
Maybach	210	630	4LZ aluminum	49.2	Jan. 11, '15	Apr. 13, '15	3	M	Hit by gun fire in attack on Poperinghe, wrecked at Thielt
Maybach	210	630	3 Lorenzen wood	49.2	Mar. 8, '15	Sept. 16, '16	18.2	O	Burned in Fuhlsbüttel shed
Maybach	210	630	4LZ aluminum	49.2	Feb. 28, '15	June 7, '15	3.3	M	Hit by aviators after attack on Calais
Maybach	210	840	4 Lorenzen	56.0	Apr. 3, '15	June 7, '15	2	P	Destroyed by British aviators in Brüssel-Evere shed
Maybach	210	630	3 Lorenzen wood	48.0	Apr. 24, '15	Dec. 18, '15	8	O	Hit by gun fire in attack on Rowno, wrecked at Luck
Maybach	210	840	4 Lorenzen	56.0	May 13, '15	Sept. 3, '15	4.3	P	Hit by lightning at Cuxhaven and fell in flames. (2 car, 2 side bracket propellers)
Maybach	210	840	4 Lorenzen	56.0	June 7, '15	Apr., 1917	22	P	Became obsolete, dismantled in Hage shed
Maybach	210	840	4 Lorenzen	56.0	June 15, '15	Feb. 16, '17	20	P	Dismantled in Jüterbog shed following abandonment of army airship operations
Maybach	210	840	4 Lorenzen	56.0	June 21, '15	Aug. 10, '15	1.6	P	Hit by gunfire in attack on England, reached Ostend and burned
Maybach	210	840	4 Lorenzen	56.0	July 8, '15	Oct. 8, '15	3	P	Wrecked by striking mountain in Belgium. (2 car, 2 side brackets props.)
Maybach	210	840	4 Lorenzen	56.0	July 23, '15	Apr., '17	21	P	Became obsolete, dismantled in Hage shed
Maybach	210	840	4 Lorenzen	56.0	Aug. 9, '15	July, '19	47	P	Destroyed in Nordholz shed
Maybach	3-210	870	4 Lorenzen	56.0	Aug. 24, '15	Feb. 21, '16	6	P	Shot down at Révigny
Maybach	1-240	960	4 Lorenzen	56.0	Sept. 9, '15	Apr. 1, '16	7	P	Forced landing and sunk at mouth of Thames after attack on England

ticeable. Whereas Type E has a useful to total load percentage of 30.7, the Bodensee has 45.6, this all the more remarkable when the power plant increase of 600 hp. (from 360 to 960 hp.) is considered. This increase in horsepower represents a considerable increase in fixed weight which, of course, lessens the useful load for airships of the same capacity. As might be expected, the speed increases from 35.7 to 82.8 miles per hour. This increase is not entirely due to increase in power, but is due in a great part to the streamline form of the hull, and, from an aerodynamical standpoint, it probably is the best airship that has ever been built.

Of the first 22 (LZ-1 to 22 included) airships constructed, ten were used by Zeppelin or commercial companies, ten were taken over by the army, while only two were assigned to the navy. The army and navy divided equally the next 52 airships (LZ-23 to 74 inclusive) and of the remaining 40 airships, the navy secured 36 (excluding six for the navy on which building was discontinued), whereas the army only had four assigned. (The army received 12 Schütte-Lanz airships against the navy's 8.)

The Allies, from the table above, are credited with the destruction of a total of 40 rigid airships, of which 16 were shot down, 17 were hit by gun fire and subsequently wrecked, and 7 were destroyed by aviators in their sheds.

It may also be concluded from the table that forced landings are serious affairs for large rigid airships and generally result in wrecks. A total of 31 rigid airships were wrecked either through forced or bad landings. Further, 28 rigid airships caught fire either in their sheds, after being wrecked or in flight. It therefore appears reasonable that the use of helium instead of hydrogen would reduce the risk to personnel considerably as well as that of loss to a commercial company.

In regard to Item 2 of the "Conclusions" Table, all army airships (LZ—No. 26, 42, 57, 58, 63, 67, 68, 71, 73, 77 and 81) in use January, 1917, were ordered to be dismantled owing to the fact that it was decided to abandon airship operations conducted by the army. Two reasons can be assigned to this decision. First, the navy had personnel available for airship work, since the fleet was more or less confined. Second, naval officers were probably better trained to operate ships of the air, particularly in their navigational ability. The decision to abandon army airship operations probably was made in January, 1917, since the last army airship was

put in service Jan. 31, 1917, and the army airships were dismantled in the period from June to September, 1917. (One in February, 1917.)

Historical

The LZ-104, Naval L-59 airship, made a non-stop flight from Jamboli, Bulgaria, to German East Africa and back. The flight started Nov. 21, 1917, at 8 a. m. and there was a crew of 22 men on board, carrying besides gasoline, about 20 tons of medicines, bandages and special munitions, which were to be delivered to the German defenders of East Africa. Khartoum was reached when a wireless order was received ordering the airship to return because East Africa had been occupied by British forces. On Nov. 25, at 8 a. m., after a 96-hour flight, they landed at Jamboli, with, it is claimed, enough fuel, etc., for an additional 64 to 80 hours' run.

The R-34 crossed the Atlantic in July, 1919, taking 108 hours to make about 3600 miles or 5760 km. The Germans claim that the L-59 traveled on its East Africa trip about 1000 to 1500 km. further than the R-34, made it in less time, did not have the benefit of a meteorological service, had the additional difficulty of crossing the equator, which meant loss of gas due to valving, and that all in all the L-59 made a much more creditable showing. They further state that although the capacity of the L-59 was 450,000 cu. ft. greater than the R-34, the dead weight of this ship was 23,000 lb. less than the R-34.

The R-34 is more or less a copy of the LZ-76 (L-33), which was brought down at Brentwood, England, in September, 1916. When the LZ-96 (L-49) was brought down in France in October, 1917, it was examined with care and many of the later technical developments of this airship were incorporated in the R-34. It is, therefore, reasonable to give some credence to the above, for the English were undoubtedly unable in their first attempt to produce an airship holding a useful to total load percentage of 50.0, which the Germans claimed for the L-33.

As a matter of interest, it is estimated that the LZ-113 (Navy L-71) airship with a high speed of 82 miles per hour, and full useful load aboard could make a non-stop flight of about 11,160 miles, or approximately three times the distance from New York to Hamburg.

At the time of the signing of the Armistice the Zeppelin company had projected a monster airship (L-100) of 3,810,000 cu. ft. capacity, 780 ft. long, 96.4 ft. diameter, 10 engines 260 hp. each, which would have a high speed in

German Zeppelin Air

Bldg. Number	Building Shed	History	Class	Owned by	Capacity cu. ft.	No. of cells	Lgth ft.	Dia. ft.	Total Load lbs.	Useful Load (0°-760mm) lbs.	Useful Total %	Power Cars No.	Engines No.
LZ-49	Potsdam	.....	LZ-79	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-50	Friedrichshafen	.....	L-16	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-51	Loewenthal	.....	LZ-81	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-51	Loewenthal	Lengthened LZ-51	LZ-81	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-52	Loewenthal	.....	L-18	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-53	Friedrichshafen	.....	L-17	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-54	Friedrichshafen	.....	L-19	Navy	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-55	Potsdam	.....	LZ-85	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-56	Potsdam	.....	LZ-86	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-56	Potsdam	Lengthened LZ-56	LZ-86	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-57	Loewenthal	.....	LZ-87	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-57	Loewenthal	Lengthened LZ-57	LZ-87	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-58	Potsdam	.....	LZ-88	Army	1,228,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-58	Potsdam	Lengthened LZ-58	LZ-88	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-59*	Friedrichshafen	.....	L-20	Navy	1,262,000	18	586	61.3	85,800	38,500	44.9	4	4
LZ-60	Potsdam	.....	LZ-90	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-60	Potsdam	Lengthened LZ-60	LZ-90	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-61	Loewenthal	.....	L-21	Navy	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-62*	Friedrichshafen	.....	L-30	Navy	1,940,000	19	649	78.4	132,000	63,200	47.9	4	6
LZ-63	Potsdam	.....	LZ-93	Army	1,128,000	16	536	61.3	76,800	33,000	43.0	2	4
LZ-63	Potsdam	Lengthened LZ-63	LZ-93	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-64	Loewenthal	.....	L-22	Navy	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-65	Friedrichshafen	.....	LZ-95	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-66	Potsdam	.....	L-23	Navy	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-67	Loewenthal	.....	LZ-97	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-68	Loewenthal	.....	LZ-98	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-69	Potsdam	.....	L-24	Navy	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-70	Loewenthal	.....	L-26	Navy	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-71	Potsdam	.....	LZ-101	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-72	Loewenthal	.....	L-31	Navy	1,940,000	19	649	78.4	132,000	66,000	50.0	4	6
LZ-73	Potsdam	.....	LZ-103	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-74	Friedrichshafen	.....	L-32	Navy	1,940,000	19	649	78.4	132,000	66,000	50.0	4	6
LZ-75	Staaken	.....	L-37	Navy	1,940,000	19	649	78.4	132,000	66,000	50.0	4	6
LZ-76	Friedrichshafen	.....	L-33	Navy	1,940,000	19	649	78.4	132,000	66,000	50.0	4	6
LZ-77	Potsdam	.....	LZ-107	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-78	Loewenthal	.....	L-34	Navy	1,940,000	19	649	78.4	132,000	68,200	51.6	4	6
LZ-79	Staaken	.....	L-41	Navy	1,940,000	19	649	78.4	132,000	68,200	51.6	4	6
LZ-80	Friedrichshafen	.....	L-35	Navy	1,940,000	19	649	78.4	132,000	68,200	51.6	4	6
LZ-81	Potsdam	.....	LZ-111	Army	1,262,000	18	586	61.3	85,800	38,500	44.9	2	4
LZ-82	Friedrichshafen	.....	L-36	Navy	1,940,000	19	649	78.4	132,000	70,400	53.3	4	6
LZ-83	Staaken	.....	LZ-113	Army	1,940,000	19	649	78.4	132,000	70,400	53.3	4	6
LZ-84	Loewenthal	.....	L-38	Navy	1,940,000	19	649	78.4	132,000	71,500	54.2	4	6
LZ-85	Staaken	.....	L-45	Navy	1,940,000	19	649	78.4	132,000	71,500	54.2	4	6
LZ-86	Friedrichshafen	.....	L-39	Navy	1,940,000	19	649	78.4	132,000	71,500	54.2	4	6
LZ-87	Staaken	.....	L-47	Navy	1,940,000	19	649	78.4	132,000	71,500	54.2	4	6
LZ-88	Friedrichshafen	.....	L-40	Navy	1,940,000	19	649	78.4	132,000	71,500	54.2	4	6
LZ-89	Staaken	.....	L-50	Navy	1,940,000	19	649	78.4	132,000	71,500	54.2	4	6
LZ-90	Loewenthal	.....	LZ-120	Army	1,940,000	19	649	78.4	132,000	71,500	54.2	4	6
LZ-91*	Friedrichshafen	.....	L-42	Navy	1,960,000	18	645	78.4	133,000	79,200	59.5	4	5
LZ-92	Friedrichshafen	.....	L-43	Navy	1,960,000	18	645	78.4	133,000	79,200	59.5	4	5
LZ-93*	Loewenthal	.....	L-44	Navy	1,970,000	18	645	78.4	134,000	82,500	61.5	4	5
LZ-94	Friedrichshafen	.....	L-46	Navy	1,970,000	18	645	78.4	134,000	82,500	61.5	4	5
LZ-95*	Friedrichshafen	.....	L-48	Navy	1,970,000	18	645	78.4	134,000	85,800	61.5	4	5
LZ-96	Loewenthal	.....	L-49	Navy	1,970,000	18	645	78.4	134,000	85,800	61.5	4	5
LZ-97	Friedrichshafen	.....	L-51	Navy	1,970,000	18	645	78.4	134,000	85,800	61.5	4	5
LZ-98	Staaken	.....	L-52	Navy	1,970,000	18	645	78.4	134,000	85,800	61.5	4	5
LZ-99	Staaken	.....	L-54	Navy	1,970,000	18	645	78.4	134,000	85,800	61.5	4	5
LZ-100*	Friedrichshafen	.....	L-53	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-101	Loewenthal	.....	L-55	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5

*First airship of its type.

ships (Rigid)—Continued

Engines Type	Engines H. P.	Total H. P.	Propellers No. & Material	Spd mph	Date First Flight	Placed Out of Service	Life Mths	Type Development	REMARKS
Maybach	210	840	4 Lorenzen	56.0	Aug. 2, '15	Jan. 30, '16	6	P	Hit by gun fire in attack on Paris, forced landing and wrecked at Ath
Maybach	240	960	4 Lorenzen	56.0	Sep. 23, '15	Oct. 19, '17	25	P	Destroyed after bad landing at Nordholz
Maybach	240	960	4 Lorenzen	56.0	Oct. 7, '15	Sep. 27, '16	11.7	P	Hit by gun fire in attack on Buehar-est, forced landing at Trnovd and wrecked
Maybach	240	960	4 Lorenzen	56.0	Nov. 3, '15	Nov. 17, '15	0.5	P	Destroyed by fire in Tondern shed
Maybach	240	960	4 Lorenzen	56.0	Oct. 20, '15	Dec. 28, '16	14.3	P	Destroyed by fire in Tondern shed
Maybach	240	960	4 Lorenzen	56.0	Nov. 27, '15	Feb. 2, '16	2.1	P	Fell into North Sea
Maybach	210	840	4 Lorenzen	56.0	Sep. 12, '15	May 5, '16	7.8	P	Hit by gunfire in attack on Saloniki (Greece). Forced landing at Wardar and wrecked
Maybach	210	840	4 Lorenzen	56.0	Oct. 10, '15	Sept. 4, '16	10.8	P	Wrecked after bad landing at Temesvar
Maybach	240	960	4 Lorenzen	56.0	Dec. 6, '15	July 28, '17	20	P	Dismantled in Jüterbog shed after curtailment of army airship operations
Maybach	240	960	4 Lorenzen	56.0	Nov. 14, '15	Sept. 15, '17	23	P	Taken over by navy as experimental airship L-25, became obsolete, dismantled in Potsdam shed
Maybach	240	960	4 Lorenzen	56.0	Dec. 21, '15	May 3, '16	5.4	Q	Encountered engine trouble after attack on England, wrecked at Stavanger
Maybach	240	960	4 Lorenzen	56.0	Jan. 1, '16	Dec. 7, '16	11.2	P	Broke loose during storm at Wittmund and disappeared at sea (unmanned)
Maybach	240	960	4 Lorenzen	56.0	Jan. 10, '16	Dec. 28, '16	10.5	Q	Shot down at Lowestoft on English coast
Maybach	240	1440	6 Lorenzen	62.2	May 28, '16	Summer '20	50	P	Dismantled in Seerappen shed. (Crew 22) (first ship fitted with side cars)
Maybach	210	840	4 Lorenzen	56.0	Feb. 23, '16	Summer '17	17	P	Dismantled in Trier shed after curtailment of army airship operations
Maybach	240	960	4 Lorenzen	56.0	Mar. 3, '16	May 14, '17	14.3	Q	Shot down by torpedo boats at Terschelling
Maybach	240	960	4 Lorenzen	56.0	Jan. 31, '16	Feb. 22, '16	0.7	Q	Hit by gunfire while flying over Champagne front and wrecked at Namur
Maybach	240	960	4 Lorenzen	56.0	Apr. 8, '16	Aug. 22, '17	16.5	Q	Shot down by torpedo boats at Horn's reef
Maybach	240	960	4 Lorenzen	56.0	Apr. 4, '16	July 5, '17	15	Q	Dismantled in Jüterbog shed after curtailment of army airship operations
Maybach	240	960	4 Lorenzen	56.0	Apr. 28, '16	Aug. '17	16	Q	Dismantled in Schneidemühl shed after curtailment of army airship operations
Maybach	240	960	4 Lorenzen	56.0	May 20, '16	Dec. 28, '16	7.2	Q	Burned in Tondern shed
Maybach	240	960	4 Lorenzen	56.0	June 29, '16	Sept. '17	14.5	Q	Dismantled in Jüterbog shed after curtailment of army airship operations
Maybach	240	1440	6 Lorenzen	60.3	Aug. 12, '16	Oct. 2, '16	1.7	R	Shot down in attack on London
Maybach	240	960	4 Lorenzen	56.0	Aug. 8, '16	Aug. '17	12	Q	Dismantled in Königsberg shed after curtailment of army airship operations
Maybach	240	1440	6 Lorenzen	60.3	Aug. 4, '16	Sept. 24, '16	1.7	R	Shot down in attack on London
Maybach	240	1440	6 Lorenzen	60.3	Nov. 9, '16	Summer '20	44	R	Taken apart in Seddin shed. To be re-erected in Japan
Maybach	240	1440	6 Lorenzen	60.3	Aug. 30, '16	Sept. 24, '16	0.8	R	Hit by gunfire, forced landing at Brentwood England, and there dismantled. (4 car, 2 side bracket propellers)
Maybach	240	960	4 Lorenzen	56.0	Oct. 16, '16	July '17	9	Q	Dismantled in Darmstadt shed after curtailment of army airship operations
Maybach	240	1440	6 Lorenzen	60.3	Sept. 22, '16	Nov. 28, '16	2.2	R	Shot down by English aviators at Scarborough on English coast. (4 car, 2 side bracket propellers)
Maybach	240	1440	6 Lorenzen	60.3	Jan. 15, '17	July '19	30	R	Destroyed in Nordholz shed. (4 car propellers)
Maybach	240	1440	6 Lorenzen	60.3	Oct. 12, '16	Summer '18	21	R	Became obsolete, dismantled in Jüterbog shed
Maybach	240	960	4 Lorenzen	56.0	Dec. 20, '16	Aug. 10, '17	7.7	Q	Dismantled in Dresden shed after curtailment of army airship operations
Maybach	240	1440	6 Lorenzen	60.3	Nov. 1, '16	Feb. 7, '17	3.2	R	Wrecked in fog at Rethem (Aller)
Maybach	240	1440	6 Lorenzen	62.5	Feb. 22, '17	Oct. 8, '20	43.5	R	Flew from Seddin to Maubeuge and turned over to France
Maybach	240	1440	6 Lorenzen	62.5	Nov. 22, '16	Dec. 29, '16	1.2	R	Wrecked at Seemuppen (Russia)
Maybach	240	1440	6 Lorenzen	62.5	Apr. 2, '17	Oct. 20, '17	6.5	R	Wrecked after attack on England in Saone Valley
Maybach	240	1440	6 Lorenzen	62.5	Dec. 11, '16	Mar. 17, '17	3.2	R	Shot down at Compiègne
Maybach	240	1440	6 Lorenzen	62.5	May 1, '17	Jan. 5, '18	8	R	Destroyed by explosion and fire in Ahlhorn shed
Maybach	240	1440	6 Lorenzen	62.5	Jan. 3, '17	June 17, '17	5.5	R	Wrecked at Neuenwalde (Geestemünde)
Maybach	240	1440	6 Lorenzen	62.5	June 9, '17	Oct. 20, '17	4.3	R	Landed at Montigny Le Roi after attack on England. Finally wrecked in Switzerland
Maybach	240	1440	6 Lorenzen	62.5	Jan. 31, '17	.....	.....	R	Journeyed from Königsberg to Rome and turned over to Italy
Maybach	240	1200	5 Lorenzen	60.3	Feb. 21, '17	July '19	29	S	Destroyed in Nordholz shed (4 car propellers)
Maybach	240	1200	5 Lorenzen	60.3	Mar. 6, '17	June 14, '17	3.2	S	Shot down by English fleet over North sea. (4 car, 2 side bracket propellers)
Maybach	240	1200	3 Lorenzen 1 Jaray-LZ	60.3	Apr. 1, '17	Oct. 20, '17	6.7	T	Driven off course in attack on England and shot down in France (2 engines on single propeller)
Maybach	240	1200	3 Lorenzen 1 Jaray-LZ	60.3	Apr. 24, '17	Jan. 5, '18	8.3	T	Destroyed by explosion and fire in Ahlhorn shed. (4 car propellers)
Maybach	240	1200	4 Jaray-LZ	66.0	May 22, '17	June 17, '17	0.8	U	Shot down at Ipswich. (4 car propellers)
Maybach	240	1200	4 Jaray-LZ	66.0	June 13, '17	Oct. 20, '17	4.2	U	Driven off course after attack on England, wrecked at Bourbonne Les Bains, France
Maybach	240	1200	4 Jaray-LZ	66.0	July 6, '17	Jan. 5, '18	6	U	Burned in Ahlhorn shed. (4 car props.)
Maybach	240	1200	4 Jaray-LZ	66.0	July 4, '17	Aug. '19	25	U	Destroyed in Wittmund shed (4 car propellers)
Maybach	240	1200	4 Jaray-LZ	66.0	Aug. 13, '17	July 19, '18	11.2	U	Destroyed by English aviators in Tondern shed
Maybach	240	1200	4 Jaray-LZ	67.0	Aug. 18, '17	Aug. 11, '18	12	V	Shot down at Terschelling (4 car props.)
Maybach	240	1200	4 Jaray-LZ	67.0	Sept. 1, '17	Oct. 20, '17	1.7	V	Hit by gunfire in attack on England, wrecked at Tiefenort (Werra)

excess of 82.8 m.p.h. and a useful load in excess of 180,000 lb. with a total load of 259,000 lb. These weights give a useful to total load percentage in excess of 69.5. It had a maximum altitude of 26,900 ft., which compares with 6600 ft. for the LZ-24 (L-3) and 21,600 ft. for the LZ-113 (L-71).

Recent Aeronautic Features in Foreign Countries

SOME interesting comment has been given recently in regard to certain recent features of aeronautic development in European countries.

The London Daily Mail of April 14, 1921, contains the following, prepared by Harry Harper, technical secretary of the Civil Aerial Transport Committee:

"A vista so wonderful that our whole conception of the place of aircraft in the scheme of transport may have to be altered. Such is the promise of the new 'pulsating' wing of the Austrian scientist, Professor Raimund Nimfuhr. . . .

"The theory on which Professor Nimfuhr has been working is that we should concentrate attention on the propulsive methods of birds and insects. Aeroplanes with fixed wings and an engine driving a propeller can, according to this line of research, be shown vastly inferior in relative performance to either a bird or an insect.

"If one could take a bird like an albatross and increase it in size till it was as big as a medium-sized present-day biplane, it would, it is claimed, exert not more than the equivalent of about 10 hp. in propulsion, whereas the biplane would require about 200 hp. A giant gnat, big as an aeroplane, it is averred, would fly with infinitely less exertion of power than is required for any of our existing machines.

"The Nimfuhr principle is to imitate mechanically, so far as it is possible to do so, the methods of Nature, in the wings of birds and insects. The Nimfuhr 'pulsating wing' relies upon an extraordinarily rapid vibrating or stroke action upon the cushion of compressed air which in flight is formed beneath a sustaining plane.

"The actual Nimfuhr wing, as constructed, for a full-sized machine, will, it is understood, be hollow, with a flexible membrane on the underside. By pneumatic mechanism this membrane is set pulsating or vibrating with such rapidity that waves of atmospheric pressure are generated, which shall, it is intended, not only

sustain but also propel the machine. Air screws will, in fact, be eliminated."

Writing in the London Observer, April 17, 1921, Major C. C. Turner, R.A.F., states in part:

"Dr. Nimfuhr's 'solution' of the problem of soaring flight by means of a pulsating wing has yet to be proved scientifically sound; and, if that, mechanically expressible.

"At the moment the principal and most promising flight mechanism outside the aeroplane appears to be the helicopter, and especially some combination of helicopter and aeroplane. Some difficulties at one time supposed to be insuperable are no longer considered even formidable; and so convincing are the claims of helicopterists that both the British and the French governments have given financial aid for experiments. In England Mr. Louis Brennan of monorail fame, has been experimenting for years in the full confidence of the Government.

"It used to be supposed that even if vertical ascents proved feasible, the question of lateral motion by the same machine still had to be settled. This difficulty appears to have been overcome by the simple operation of slightly inclining the screws, so that instead of rotating on a vertical axis their thrust is a few degrees from the direct downward. High speed in a horizontal direction is then attained."

German Zeppelin Air

Bldg. Number	Building Shed	History	Class	Owned by	Capacity cu. ft.	No. of cells	Lgth ft.	Dia. ft.	Total Load lbs.	Useful Load (0°-760mm) lbs.	Useful Total %	Power Cars No.	Engines No.
LZ-102*	Friedrichshafen		L-57	Navy	2,420,000	16	743	78.4	164,500	114,400	69.6	4	5
LZ-103	Staaken		L-56	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-104	Staaken	Made trip to East Africa and return	L-59	Navy	2,420,000	16	743	78.4	164,500	114,400	69.6	4	5
LZ-105	Friedrichshafen		L-58	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-106	Friedrichshafen		L-61	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-107	Loewenthal		L-62	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-108	Staaken		L-60	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-109	Staaken		L-64	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-110	Friedrichshafen		L-63	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-111	Loewenthal		L-65	Navy	1,975,000	14	645	78.4	134,300	88,000	65.6	4	5
LZ-112*	Friedrichshafen		L-70	Navy	2,400,000	15	743	78.4	163,000	Over 88,000	over 59.4	6	7
LZ-113	Friedrichshafen		L-71	Navy	2,400,000	15	743	78.4	163,000	Over 88,000	over 59.4	6	7
LZ-114	Loewenthal		L-72	Navy	2,400,000	15	743	78.4	163,000	over 88,000	over 59.4	6	7
†													
LZ-120*	Friedrichshafen		Bodensee	Delag	705,000	11	396	61.3	48,000	22,000	45.8	1 passenger	4
LZ-120	Friedrichshafen	Length increased	Bodensee	Delag	796,000	12	425	61.3	54,100	25,300	46.8	3 power	4
LZ-121	Friedrichshafen		Nordstern	Delag	796,000	12	425	61.3	54,100	25,300	46.8	"	4

*First airship of its type. †LZ-115 to LZ-119 not built.

Below is given a summary of the ultimate disposal of all rigid airships built by Germany.

Disposition	Zeppelin	Schütte-Lanz	Totals
1. Dismantled—Obsolete	11	5	16
2. Dismantled—Army Airship Operations Abandoned	11	2	13
3. Shot Down in War	15 (a)	1	16
4. Hit by Gun Fire and Wrecked	17 (b)	0	17
5. Wrecked, Storm, Forced Landing, etc.	12	3	15
6. Wrecked, Bad Landings, etc.	11	5	16
7. Destroyed in Shed by Fire	14 (c)	3	17
8. Destroyed While Handling on Ground	4	0	4
9. Destroyed by Fire in Flight	4 (d)	2	6
10. Turned over to Allies	7 (e)	0	7
11. Wrecked Deliberately Since Armistice	7 (f)	0	7
12. Building Discontinued	6	1	7
13. Now in Commission	2 (g)	0	2
Totals	121	22	143

(a) One shot down by aviators.

(b) Two burned after wreck.

(c) Seven destroyed due to aviator's bombs.

(d) Two fell burning, cause unknown; one hit by lightning.

(e) Two each for England, France, Italy; one for Japan.

(f) All wrecked in sheds deliberately to evade Peace Treaty conditions.

(g) Bodensee and Nordstern, LZ-No. 120, 121. Allied Commission claims these as replacement for (f).

The summary below divides the rigid airships into groups according to owners.

	Zeppelin	Schütte-Lanz	Totals
Civilian	12	1	13
Army	40	12	52
Navy	63	8	71
Building Discontinued	6 (a)	1 (b)	7
Totals	121	22	143

(a) Naval airships.

(b) Army airships.

ships (Rigid)—Continued

Engines No.	Engines Type	Engines H. P.	Total H. P.	Propellers No. & Material	Spd mph	Date First Flight	Placed Out of Service	Life Mths	Type Development	REMARKS
5	Maybach	240	1200	4 Jaray-LZ	62.5	Sept. 26, '17	Oct. 7, '17	0.3	W	Burned in front of Jüterbog shed. (4 car propellers)
5	Maybach	240	1200	4 Jaray-LZ	67.0	Sept. 24, '17	Aug. '19	23	V	Destroyed in Wittmund shed. (4 car propellers)
5	Maybach	240	1200	4 Jaray-LZ	62.5	Oct. 10, '17	Apr. 7, '18	6	W	Fell burning over straits of Otranto. Cause unknown. (4 car propellers)
5	Maybach	290	1450	4 Jaray-LZ	about 71.5	Oct. 29, '17	Jan. 5, '18	2.2	V	Destroyed by explosion in Ahlhorn shed
5	Maybach	290	1450	4 Jaray-LZ	71.5	Dec. 12, '17	Aug. 29, '20	32.5	V	Flew from Wittmund to Rome and turned over to Italy. (4 car props.)
5	Maybach	290	1450	4 Jaray-LZ	71.5	Jan. 19, '18	May 10, '18	3.8	V	Fell while flying over Heligoland. (4 car propellers)
5	Maybach	290	1450	4 Jaray-LZ	71.5	Dec. 18, '17	July 19, '18	7	V	Destroyed by English aviators in Tondern shed. (4 car propellers)
5	Maybach	290	1450	4 Jaray-LZ	71.5	Mar. 11, '18	July 22, '20	28.4	V	Flew from Ahlhorn to Pulham and turned over to England. (4 car props.)
5	Maybach	290	1450	4 Jaray-LZ	71.5	Mar. 4, '18	July, '19	16	V	Destroyed in Nordholz shed. (4 car propellers)
5	Maybach	290	1450	4 Jaray-LZ	71.5	April 17, '18	July, '19	15	V	Destroyed in Nordholz shed. (4 car propellers)
7	Maybach	290	2030	6 Jaray-LZ	about 80.5	July 1, '18	Aug. 5, '18	1	X	Shot down at Boston. Streamline fins. (6 car propellers, direct drive)
7	Maybach	290	2030	6 Jaray-LZ	80.5	July 29, '18	July 1, '20	23	X	Flew from Ahlhorn to Pulham and turned over to England. Streamline fins. (6 car propellers)
7	Maybach	290	2030	6 Jaray-LZ	80.5	July 9, '20	.....	.....	X	Flew from Loewenthal to Maubeuge and turned over to France. Streamline fins. (6 car propellers)
4	Maybach	240	960	3 Jaray-LZ	82.8	Aug. 20, '19	.....	45.8	Y	Not put in service after length was increased because of allied commission's restrictions
4	Maybach	240	960	3 Jaray-LZ	.....	.....	.....	.....	.....	Crew 15, passengers 20 to 25. (3 car propellers)
4	Maybach	240	960	3 Jaray-LZ	.....	.....	.....	.....	.....	Not put in service because of allied commission's restrictions

The Holland correspondent of the London Times reported March 30:

"Mr. A. Boerner, a Dutch airman, has invented a new type of airship, for which it is claimed that it needs no ballast and is not subject to loss of gas. More important than either of these is the claim that in the Boerner airship the danger of explosion is eliminated.

"Briefly, the design of the airship is as follows: The balloon proper consists of a large number of individual gas cells attached to a bridge chassis made of duralumin.

escaping as soon as a hole is burned in the envelope.

"The Boerner airship is about 950 ft. long and is to be propelled by 32 gasoline engines, to each of which an air screw is attached. The total horsepower developed will be 6400. On half its power the airship is to fly at a speed of 72 miles an hour. By the Boerner system the air screws may, together or in groups, be adjusted so as to propel the airship in any direction. The suggested number of passengers that the airship will be able to carry is 300."

All the machinery is carried in the latter. There is a passenger deck with space for staterooms, dining-rooms and so forth, for passengers and crew. The envelope and the chassis are built in sections so that the airship can be enlarged. The airship is to be fitted with what is called the three-chamber system, using hydrogen, nitrogen and air. This is the device that provides protection against explosion, ignition and lightning. It is reported to reduce the loss of lifting gas (hydrogen) due to diffusion to 1 per cent as compared with other systems.

"The airship is to be fitted with a new propeller system which should make it possible to use all the dynamic forces of the vessel for forward, upward, backward and downward drive. Not the least important result, it is hoped to obtain from this equipment, is that of reliable landing without assistance from the ground.

"The hydrogen in the envelope is separated on all sides from the atmospheric air by a wall of nitrogen; these are the means used to eliminate the danger of fire. Should the outer envelope catch fire the flame, it is claimed, will be extinguished by the nitrogen

Development of Aircraft Tires and Wheels

McCOOK FIELD Air Service Engineering Division activities in the rubber materials used in aircraft construction have been mainly centered around the development of the straight side tires and wheels. A satisfactory program of wheel and tire sizes has been drawn up after considerable experimental work, and it is hoped that tire and wheel replacements will be of the straight side type, rather than of the present clincher type.

Experimental work on the development of straight side tires and wheels has extended over a period of about two years. The chief reason for an attempt to develop the straight side tire has been that the unsatisfactory performance of the clincher type was most marked in the case of the DeHaviland airplanes, which use the 750x125-millimeter tires.

At best, the clincher tire has never been satisfactory, even in the case of automobiles, except in the smallest sizes. Underinflation was the chief contributing cause, as the majority of the trouble experienced was due to rim cutting. A secondary contributing cause was the type of wheel used, which is essentially an unbalanced structure.

The first service test on the straight side tires was made with the 44x10-inch tire, used on the Glenn L. Martin airplane, of the type which has only two wheels.

To date the performance of these tires and the service, which extended over a period of about six months, has been very satisfactory.

Another size which has been subjected to service conditions is the 36x8-inch tire, which was developed with a view to replacing the 900x200-millimeter size. An essential difference between this size and the 44x10-inch size is that the wheel for the 36x8-inch tire has a one-piece rim, having a channel in the center to permit of the application of the casing. In general, it resembles a type of rim used on the Fokker D-7, which was equipped with a straight side tire. The wheel for the 44x10-inch tire has a truck-type rim. This includes the removable side ring to permit of ease of application or removal of the casing.

In every case of straight side tires the wheel used has a hub which is centered in the wheel, as opposed to the Palmer type of off-set hub. Other sized tires are being manufactured for service test, and it should not be long before complete information is available regarding the suitability and serviceability of this type, as compared to the original clincher type. It is believed that the difficulties experienced with the clincher type tires, especially when used on the Palmer type wheel, will be completely overcome in the straight side tires.

Automotive Demands Give Strong Impetus to Drop Forging Development

"The automotive industry was one of the first to appreciate the advantages of drop forgings," said an executive recently. The extent to which technical drop forging practice has been influenced by automotive demands is a phase of relations between the two industries discussed.

THE automotive industry has not only achieved very rapid growth itself during the last decade, but has been the cause of very marked technical and commercial development in certain contributory industries. One of these which has profited largely from its contact with the automotive field is the drop-forging industry.

The drop forge industry in the United States has had two major booms during its long existence. Drop forgings have always been used extensively in connection with firearms and ordnance, while they have been utilized also to some extent in railroad work and more recently in shipbuilding. The first real boom, however, was caused by contact with the bicycle industry, which attracted so much attention about twenty-five years ago. Next the automobile industry started its great rise.

Technical Development

To this latter contact can be traced a large percentage of the recent technical growth of the drop forging industry. The development of new methods has been very rapid during recent years and has been inspired chiefly by the demands of the automotive industry. The development of crankshaft manufacture may be cited as an instance of this development. Automobile and truck makers have been demanding an increasing accuracy in the manufacture of this part. As a result the drop forgers, through extensive experimentation and intensive research, have succeeded in meeting that demand. The same thing is true to a large extent of almost every drop forged part used on cars and trucks.

As the demands grew, many progressive drop forge concerns began to try to anticipate future demands, that they might be ready to meet requests as soon as they were made. Consequently, it has been possible for drop forgers on occasion to present to the automotive industry new methods for making better and more accurate forgings from time to time.

Drop forgings, of course, compete directly with malleable and steel castings in selling to the automotive industry. For this reason the drop forgers have made considerable effort in individual cases to study the possibilities for an increased use of forgings on cars and trucks; to devise new forging methods to meet automotive needs, with the idea of attempting to replace castings in certain instances.

Up to the present time, however, the demands upon the drop forgers have been so great that they have been kept busy to a large extent keeping pace with the demands made upon them, to the detriment of this experimental and research work. One prominent drop forge executive says, for instance, that:

"The general opinion seems to be that during the last few years the development along this line has not been carried on because of the high production requirements

in the regular line, but since the dropping off in production has come about there is a very great effort being made along this line."

Such research is directly in line with the most urgent needs of automotive manufacturers at the present time. Reduction of production costs is necessary and material assistance can be rendered by a contributory industry such as this by research and experimental work.

Drop Forging Characteristics

Taken in a general way, the drop forging has always possessed certain characteristics which made it specially adaptable for automobile and truck construction. Some of these qualities, familiar to engineers, may be listed as follows:

1. Comparatively great uniformity of quality: not subject to certain defects, such as blow-holes
2. Suited to quantity production methods
3. Tensile strength and percentage of elongation in given length practically always high enough to meet requirements, even though highest grade steels or alloys are not used
4. Uniformity as to thickness, etc.
5. Possibility of producing forging to very close tolerances, thus necessitating a comparatively small amount of machining. The ordinary drop forging can be produced to a tolerance of 1/32 in., but many forgings are now being produced to smaller tolerances

One of the chief drop forging developments for which the automobile industry is largely responsible is in connection with the handling of high efficiency steel and new alloy combinations. As a result of efforts along these lines drop-forging operations are possible to-day that were considered utterly impossible fifteen years ago.

Limitations of Practice

Although remarkable strides have been made in drop-forging practice to meet the requirements of automotive engineers, there are limits to what can be accomplished. Discussion at the convention of the American Drop Forge Association during recent years indicates that engineers and designers sometimes make their design entirely from an engineering viewpoint without considering the limitations of drop-forging practice, even though they expect to use drop-forgings in construction.

One drop-forging manufacturer expressed it this way: "Drop-forgers should be called in for consultation and advice when new designs are being worked out. Or at least preliminary drawings or sketches should be sent to prospective sources of supply to get constructive suggestions and to avoid the revising of completed designs and details. Many drop forgers are more than willing to render their services to their regular customers, if not to the trade at large, and in many instances the saving has been enormous."

There is obviously an excellent field for co-operation along this line, since it is readily conceivable that considerable expense may be saved the manufacturer if, in making a design, he takes into consideration the limitations of drop-forging practice.

Co-operative Possibilities

In connection with the possibilities for profitable co-operation between the designer and the drop-forger the following statement recently made by a member of the drop-forge industry is of interest.

"There is no question but that the average automobile engineer and designer should be very well acquainted with the difficulties encountered in making drop forgings, in order to design forgings to the best advantage. There are a very large number of forgings made the production of which cause a great amount of trouble, and which can be produced only at a very high cost.

"This trouble and extra cost is made necessary through ignorance of the designing engineer of the fundamental principles of drop forgings. If the designing engineer had known the way in which forgings of a similar design were made, the design of the parts in question could have been simplified so as to render the forging easy to make, and at the same time capable of serving its purpose just as effectively.

"The general trend among automotive engineers, however, is to work more closely with the drop-forge industry in the designing of important parts, so that such difficulties can be eliminated and the best part for the least cost be produced."

While most of the progressive drop forge concerns are ready to render such co-operative service, the car designer and engineer has not always been satisfied with the kind of help extended. One prominent engineer, for example, complained recently that his experience had been that the drop forgers in making suggestions for simplification for manufacture did not take sufficiently into account the desire of the designer for individuality and other similar factors.

It must be admitted, moreover, that the drop forgers have not attempted very extensively, except in a few individual cases, to bring directly before the automotive engineer the various features and possibilities of their practice. An investigation of the situation indicates that very little sound publicity work has been done along these lines by drop forgers in general. It would seem that a definite attempt to reach directly the automotive engineers with information of this kind would increase the possibilities of mutually helpful co-operation.

Drop Forging Process

The details of drop forging practice cannot be adequately described, of course, in a brief article, but certain essential features can be outlined which will be of general interest. The process of drop forging is more complex than is sometimes understood; it consists of far more than merely heating metal and hammering it between dies. As one authority says, "The production of high grade forgings is, in reality, a co-ordination of many functions carried through with a nice regard for their effect upon one another."

The first factor of importance is that of chemical analysis and heat treatment. The chemical properties of any given lot of steel are a fixed quantity, but the physical properties can be changed by the application of the proper heat treatment. The amount of change possible by heat treatment, of course, is limited to a certain extent by the chemical analysis of the particular lot.

In the actual forging process several sets of dies are

used. One set is used for forging, one set for trimming, and other sets for punching and bending. A properly constructed and sufficiently strong die is the chief essential of successful drop-forging. The value of a die from the point of view of the forging buyer should be judged rather in accordance with the quantity and quality of the forgings produced from it than with the actual initial cost of the die itself. One of the prominent forging concerns says that "the best dies cost anywhere from three to five times what poorer grades cost, but they are always cheapest in the end. A die made from good steel, carefully hardened and finished to a high polish, will make more forgings than a cheap die and will make them better."

The making of dies is a difficult job, requiring the highest skill in workmanship. The various steps in constructing a die may be listed in general as follows:

1. The die block is planed smooth on the impression side, and the opposite side is cut a key, which holds the block in place on the ram or in the sow block of the hammer
2. The impression side is thinly copper plated and the outline of the forging is etched through the plating
3. The rough impressions are cut out on a mill or lathe
4. The die is finished by expert hand tooling

When the finished impression has been sunk in the die, a sample cast of Babbit metal is obtained, by means of which the general outlines of the piece can be checked up and suggestions made for changes before the die is finally finished to accurate dimensions.

The next step is to select stock of the shape which can be handled and forged most economically. Billets, round and square bars, or flats, are ordinarily used. There is a distinct danger of choosing too small a bar in an effort to reduce the amount of waste. The size of the stock should be large enough to permit the metal to be worked clear through and not merely on the surface.

There are four different operations on the piece while actually under the hammer:

1. Edger
2. Break down
3. Finishing pass
4. Cut off

A certain amount of excess stock, known as the flash, must always be removed from the forging after it comes from the hammer. This is the trimming operation. Trimming is followed by cleaning, after which the heat treatment takes place, provided this is to be done at the forge shop.

Difficulties

Certain definite difficulties present themselves in drop-forging practice. Every forging is not perfect, of course, even though the best manufacturing methods be adopted. A large proportion of defective forgings can be traced to defective dies. Some defects, such as laps, are superficial and do not affect the quality of the forging, but others are more serious. Among the chief possible defects are checks, laps, excess stock, scale pits, round corners, burrs, pipes and seams.

In a high grade shop, of course, forgings with such defects never get outside the forge shop. They are of interest to the customer chiefly since his design and demands sometimes affect one way or the other the possibility of producing a high percentage of perfect forgings.

Work of Drop Forge Association

The American Drop Forge Association comprises about 68 per cent of all the drop forge concerns in the

country and probably about 90 per cent of the total tonnage produced each year. This association has interested itself in the quality of the work done by its members, although the results of this interest are not recorded in definite statistics.

The Drop Forge Association has from time to time studied and compiled various tables of standard tolerances of drop forge practice, both with regard to dimensional limits and the weight limits of various types of forgings. The association uses the S. A. E. standard specification for forgings and attempts to see that all the forgings produced by its members are held well within those limits.

While definite figures are not available, a careful estimate states that fully 90 per cent of the output of the drop-forging industry has been absorbed by automotive manufacturers during the last five years.

The Drop Forge Association has not, as a body, undertaken anything in the way of research work up to the present time. The statement is authorized from a responsible source, however, that work of this kind, similar to that being done by the American Malleable Castings Association, is likely to be taken up and carried forward in the very near future.

One reason that records are not available to show the increased quality of the physical characteristics of forgings over a period of years is that a large percentage of the forgings produced by members of the Association are supplied to automotive manufacturers with no final heat treatment. Several individual members of the Asso-

ciation, however, have built up very strong laboratory and research forces and have carried work of this kind to a very high state of development. These standards are really considered by the rest of the industry as the standards for automotive work.

The recently formed American Drop Forge Institute is an association of the executives of the various drop forge companies designed to further the general interests of the drop forging industry along broad and constructive co-operative lines.

The Association has dealt entirely with practical shop problems, but the Institute will concern itself with the broader aspects of the industry, such as the relation of the drop-forging industry to outsiders with whom it comes in contact, uniform cost methods, the possibilities of constructive research, and so forth. It will have nothing to do with prices in any manner whatsoever, either directly or indirectly.

The Institute has been formed so recently that only these broad outlines of its purpose can be given at this time. Whether both the Institute and the Association will continue permanently or whether the Association will be merged into the Institute will be decided by the future.

The accompanying list includes the parts of a four-cylinder car which are made from drop forgings. This list is reprinted from AUTOMOTIVE INDUSTRIES of Jan. 20.

While additions might be made, the list is the most comprehensive that has yet been published and is included here for that reason.

Automotive Parts Made by Drop Forging

ENGINE

Crankshaft
Crankshaft counterweights
Crankshaft drive gear
Connecting rods
Camshaft
Camshaft drive gear
Rocker arms
Rocker arm brackets
Valves and stems
Valve lifter plungers
Valve lifter guide yokes
Magnet drive gear
Magnet idler gear
Generator drive gear
Generator strap tee, upper
Generator strap tee, lower
Pump shaft gear
Distributor drive shaft gear
Starting crank
Starter pedal
Starter pedal pad
Starter shaft lever
Starter operating shaft rod
Starter motor drive gear
Water pump drive gear
Oil pump adjusting shaft
Carburetor pipe flange
Throttle control lever
Spark control lever
Accelerator pedal
Fan supporting arm
Front motor support
Rear motor support

TRANSMISSION

First speed and reversing gear
Direct drive and second speed gear
Countershaft
Countershaft gear
Countershaft first speed gear
Countershaft second speed gear
Reversing pinion
Gear shift lever

Gear shifter shaft
Shifter rod
Shifter rod end
First speed and reversing gear and shifter fork
Direct drive and second speed gear shifter fork
Clutch pedal
Clutch pedal pad
Clutch pedal stop
Clutch throwout yoke
Clutch shifter lever
Clutch shifter shaft
Clutch spring sleeve
Clutch hub
Clutch drum
Drive shaft universal joint
Drive shaft universal joint flange
Drive shaft universal joint sleeve
Drive shaft universal joint sleeve yoke

RUNNING GEAR

Front axle
Steering knuckle, right
Steering knuckle, left
Steering spindles
Pitman arm
Steering arm
Steering yoke
Steering gear worm sector
Steering gear worm
Steering rod
Front spring shackles
Front spring plates
Front spring clip spacers
Rear spring brackets
Hand brake lever
Hand brake lever latch
Hand brake lever latch end
Hand brake tube rocker arm
Hand brake cross shaft levers
Hand brake cross shaft rocker arms
Hand brake cam levers
Hand brake levers

Hand brake lever clevis
Foot brake pedal
Foot brake pedal pad
Foot brake cross shaft rocker arms
Foot brake cross shaft levers
Foot brake operating lever
Foot brake band adjusting clevis
Foot brake band links
Brake equalizer draw bar
Brake equalizer draw bar clevis
Brake control turnbuckles
Brake pull rod clevis
Front brake band lever clevis
Torque arm
Torque arm pillar
Differential gear
Differential pinion
Differential pinion spider
Differential driving gear
Differential driving pinion
Rear axle nuts
Rear spring shackles
Rear Spring plates

ACCESSORIES

Windshield side arms
Tire carrier arms
Toe bolts
License tag clamps
Top support adjusting brackets
Top support wing bolts
Gasoline tank strap draw bolts (front)
Gasoline tank strap draw bolts (rear)
Valve tappet wrench
Valve tappet adjusting screw wrench
Valve lifting tool
Water pump stuffing nut wrench
Exhaust manifold packing nut and differential bearing adjusting nut wrench
Crankcase main bearing bolt and fly-wheel oil plug wrench
Spark control and oil reservoir drain plug wrench
Rear axle pinion shaft bearing gage

Exports of Automobiles and Tires for March, 1921

COUNTRIES	Commercial		Passenger		Parts	Tires/							
	Complete Cars	Chassis	Complete Cars	Chassis		Casings	Inner	Solid	All Other				
Europe													
Austria													
Azores and Madeira Is.													
Belgium			5	\$ 7,299	\$ 18,370		\$ 150		\$ 108				
Czechoslovakia			1	440		\$ 1,425							
Denmark	12	\$ 23,850	3	8,197	7,872	7,223			935				
Finland			2	1,135	932	490	125						
France	1	\$ 2,900	1	519	20	34,979	1	\$ 367	33,784				
Germany					1	354		1,048					
Greece		4	1,798	6	6,320	4,303	1,012	268					
Iceland and Faroe Is.			3	3,250	1,463	1,045	61						
Italy			2	842	3	4,235	831	2,393	155				
Malta, Gozo and Cyprus Is.						338	1,858						
Netherlands			10	10,228		11,026	8,060	2,104	\$ 916				
Norway	2	1,000	3	3,400		17,077	24,572	1,935	3,249				
Poland and Danzig			17	22,995		2,527	2,725		5,500				
Portugal						599							
Roumania		1	450	40	45,739	4,962	495	54					
Russia in Europe	1	2,000				72							
Spain	3	3,600	23	40,375		96,562	175	27	1,475				
Sweden	6	16,151	66	78,112		28,500	54,974	5,037					
Switzerland			95	143,520		2,686	1,788	279					
Turkey in Europe						981	6,236	1,736					
England	10	29,142	3	8,532	48	59,843	3	8,700	356,197				
Scotland							732	40					
Ireland							85						
Yugoslavia, Albania			3	1,263					493				
North and South America													
Bermuda									530				
British Honduras						308	231	31					
Canada	86	114,647	91	103,979	398	597,052	21	38,417	1,494,810				
Costa Rica	3	6,935			2	2,360			565				
Guatemala			1	450	4	6,095			2,472				
Honduras					1	1,130			1,895				
Nicaragua							1	1,300	775				
Panama					22	19,692			15,313				
Salvador									6,530				
Mexico	122	126,832	4	11,117	394	298,288	1	840	118,256				
Newfoundland and Labrador					1	2,000			2,067				
Barbados					8	4,916			8,841				
Jamaica	1	2,435	3	1,348	6	2,524	1	804	15,069				
Trinidad and Tobago			3	6,938	12	8,973			6,592				
Other British West Indies			2	450	6	4,991			1,352				
Cuba	8	13,062	5	10,589	233	142,658	2	4,496	147,014				
Virgin Islands of United States	1	2,794			4	2,146	1	367	8,955				
Dutch West Indies			3	2,302	1	363			986				
French West Indies									4,251				
Haiti					2	1,766			1,058				
Dominican Republic			1	3,000	12	16,094			4,100				
Argentina					5	18,500	5	8,152	185,306				
Bolivia									1,099				
Brazil					43	70,856			25,242				
Chile			1	4,050					9,666				
Colombia	6	14,359			3	5,349			10,945				
Ecuador	2	15,163			1	1,000			846				
British Guiana	1	4,000							6,476				
Dutch Guiana									408				
French Guiana									10				
Peru					6	23,987			20,440				
Uruguay					6	22,885			28,949				
Venezuela					20	19,939			33,477				
Asia and Far East													
Aden									659				
China	6	3,118	1	2,300	8	27,211	15	6,439	7,319				
Kwantung, leased territory									5,053				
Chosen													
British India	4	7,589	7	10,104	49	30,095			65,705				
Straits Settlements	1	2,581			1	1,200			8,683				
Other British East Indies					6	6,000			2,820				
Dutch East Indies					18	54,366	1	560	18,103				
French Indo China									105				
Hongkong					11	12,550			3,122				
Japan	25	51,537	76	42,575	118	129,470	6	18,163	37,373				
Persia									5,707				
Siam					2	3,000			749				
Turkey in Asia	6	27,250	1	545	28	15,638	1	1,200	13,880				
Australia	1	5,963	70	138,525	14	20,956	102	120,686	60,118				
New Zealand	11	26,962			28	39,108			31,955				
Other British Oceania					1	763			116				
French Oceania									1,081				
Other Oceania									510				
Philippine Islands	1	2,350			11	23,574			29,898				
Africa													
Belgian Congo									7				
British West Africa					2	1,160	2	1,230	2,474				
British South Africa	5	6,210			12	18,063			32,384				
British East Africa					1	835	2	1,426	3,937				
Canary Islands	2	4,729							5,623				
Egypt			1	1,500	2	2,952			5,596				
French Africa									1,144				
Kamerun, Etc.									2,166				
Liberia													
Morocco									1,315				
Portuguese Africa					1	2,200			150				
Total	315	\$493,309	291	\$374,921	1,850	\$213,642	169	\$217,736	\$3,097,890	\$749,610	\$99,363	\$79,324	\$40,972



The FORUM



Concerning Argentine Trade

Editor, AUTOMOTIVE INDUSTRIES:

You, of course, realize that as you are just entering upon your spring season we are entering upon the fall and our winter season will not be over until the end of September. Consequently, our best months for selling automobiles are now about over and the new season does not begin with us until September or October.

The season just now closing has not been, generally speaking, a satisfactory one to the automobile trade. The unsettled and unfavorable conditions which have been existing in Europe, Great Britain and the United States for the past several months have reflected themselves very seriously in this market, and business in most lines has been almost paralyzed. Taking our automobile season as from Sept. 1 to April 1, I do not believe that during the season just closed there were more than 33 1/3 per cent of the quantity of cars disposed of the previous season sold. During the past three or four months such demand as has existed has been confined to a very few well-known cars which have become well established here and are being handled in a proper manner. From such information as I have been able to gather through our own organization and from outside sources, I am sure that we have been selling more cars than has anyone else, with the exception of Ford. The sale of the Ford has also fallen off a very great deal. Our business this year has probably reached more or less half of what it was a year ago, but it is to be borne in mind that a year ago we were not able to get sufficient cars from the factory to fill our requirements, and I do not know to what volume the business might have run had we been able to keep in stock.

You have no doubt seen press cablegrams concerning the number of cars and trucks in the Buenos Aires Custom House, most of which reports, I think, were exaggerated, and I believe you may, therefore, be interested in knowing the facts. The Association of Automobile Importers in Buenos Aires sent some of their own employees to the Custom House to take count of all the cars and trucks deposited there and they give the total as 2003. This count was taken on March 25. This is not a large stock for normal times, but under present conditions it is excessive and will undoubtedly take a great many months to liquidate. We, fortunately, were foresighted enough last September to alter our orders to bring them more in line with the anticipated demands, and, as the General Motors Export Co., understanding perfectly the existing conditions here, co-operated with us in a very whole-hearted manner and relieved us of the possibility of having an excessive amount of cars shipped to us, our position, therefore, at the present time is very comfortable in this respect. This is, unfortunately, not true of several of the other automobile agents here, some of whom are carrying a very heavy burden, and a few houses have been forced to liquidate their automobile business and in some instances left a few cars on the hands of shippers.

The Association of Automobile Importers also fur-

nishes me with the following figures concerning the importation of automobiles and trucks during the months of January, February and March of this year:

From the United States, imported during these three months, 296 passenger cars and three trucks; from Great Britain and Europe, during same period, 66 passenger cars and 28 trucks.

You asked me how I am estimating the 1921-1922 season for the automobile business in the Argentine. I am afraid that I cannot make satisfactory reply to this question. I think it is too early yet for anyone to even guess with any degree of accuracy, and I have not attempted as yet to make any plans for next season. In July or August we should be able to form some idea, but even then one will not be able to prophesy with accuracy. We cannot tell a great deal about the prospects of next year's crops before August, and a great deal depends upon the movement of the hides, wool and cereals which are now available for export and in which there has been practically no movement for many months. Until these products move freely for export I see no possibility of any material improvement in either financial or trade conditions here, and it is impossible to say when this hoped-for movement in exports will begin. I am very much afraid that this calendar year is going to be one of liquidations very largely, with a possibility of some material improvement in conditions during the last quarter.

I wish to thank you very much for writing me, and I shall be very glad to hear from you personally at any time that you have the time and the disposition to write.

WILLARD T. CLARK,

Henry W. Peabody & Co.

Buenos Aires, April 8, 1921.

Volumetric Efficiency vs. Fuel Economy

Editor, AUTOMOTIVE INDUSTRIES:

Referring to your editorial in AUTOMOTIVE INDUSTRIES, "Is Volumetric Efficiency of Prime Importance?" issue of April 28. The last two paragraphs clearly define the effects and differences due to proper application of heat to the charge compared with the lack of sufficient heat. It is surprising that the oft-repeated argument against the application of heat on account of its tendency to reduce volumetric efficiency still continues to be put forward.

There is no question but that this is a complete fallacy, not only by reason of the fact that only 10 per cent of the time is the average passenger car engine called upon to exercise its full output, but also that this possible lack of volume, due to pre-heating of the charge, is greatly offset by the more rapid and better combustion that results from its proper preparation.

As a matter of information, it should also be pointed out that the heat taken up by the charge at full loads is greatly reduced. With wide-open throttle, the maximum temperature of the mixture occurs at the lowest speed, being rapidly reduced as the speed increases. At part loads the volume of the mixture passing through the

manifold is so small, comparatively, that the heat taken up increases, despite the fact that the external temperature of the manifold may not be as great as at wide-open throttle.

The popular conception of the heat of the charge is gained as a result of the observation of manifold temperatures, neglecting the question of heat units which can be absorbed by the mixture, which depend on volume and velocity.

We demonstrated, several years ago, with two motors identical in size and construction, with the exception of manifolding, that it was possible to obtain more torque at any speed and a greater maximum horsepower with the heat than without it, while, of course, the fuel economy was infinitely superior with the heated manifold.

There are many owners of cars, who, during the colder months of the year, use them for business purposes, probably for very short distances, and it is under these conditions that the proper heating of the charge is appreciated. Without it the engine does not run sufficiently long to function at all properly and requires constant manipulation of the choker, with its attendant ill results.

A. A. BULL, Chief Engineer,
Northway Motor & Mfg. Co., Div. Gen. Motors Corp.

The Efficiency of Weak Mixtures

Editor, AUTOMOTIVE INDUSTRIES:

The whole automotive world must feel deeply indebted to the Asiatic Petroleum Co. for providing the necessary finance to enable Messrs. H. R. Ricardo, H. T. Tizard and D. R. Pye to conduct the extremely accurate and valuable research which has now been proceeding for more than two years in England.

Among the mass of information already given to us there is one phase which, to me at least, is of the first interest by reason of its having occupied my firm devotion for many years. This is the pronounced attitude of the findings in favor of the adoption of weak mixtures, if this can be done commercially.

Quoting from the reports: "The conclusion to be drawn is that the indicated thermal efficiency of the best engines is not likely to be improved upon substantially by any development of design other than that of the employment of weaker mixtures than can now be used . . . our results show that great improvement is to be expected."

The report appears to advocate at least a 20 per cent weaker mixture than that which is theoretically correct, and states that, with a very weak mixture, ignition is only possible by the stratified charge or similar arrangement. The reason for this is that "a homogeneous mixture of fuel vapor and air cannot be exploded if the concentration of the fuel vapor is appreciably less than 80 per cent of that required for complete combustion of the air."

Discussing the question of dissociation of CO_2 with a 20 per cent weak mixture, the report states that "at the lower temperature at the end of the expansion stroke the dissociation is negligible. The work done by the expansion in such a case is practically the same as if no dissociation occurred; in fact, the only effect of dissociation is to lower the maximum temperatures and pressures without materially altering the efficiency." Mr. Ricardo shows how, with a compression ratio of 5 to 1, he reaches a critical maximum with one fuel, so that if the compression is raised and the mixture strength remains the same, detonation occurs unless a slower burning mixture is used. He prefers to do this by either retarding the timing of the ignition or by *enriching* the mixture on test, although he says that the same results

could be reached by reducing the mixture strength, but states the fact that the range on the weak side is very limited, "so narrow, indeed, that to attempt to escape detonation by working entirely on the weak side would be completely out of the question in any practical multi-cylindrical engine, on account of irregularities in distribution."

The italics drawing attention to the last phrase are my own. The report makes out a strong case in favor of the line I have followed. I have conclusively proved that the weak mixture can be used commercially and that it does reduce detonation. In 1912-13 I built several cars and had tests made by the Brooklands Racing Club on speed. One touring car of about 3000 lb. weight consistently did 26 miles to the gallon of fuel when adjusted for racing and hill climbing, and was certified doing 77.02 miles per hour on the track with the same setting.

The only way that such mixtures can be used commercially in an ordinary engine is by overcoming the distribution problem, and this is what I set out to do. I need scarcely point out the importance of every cylinder performing the same amount of work as its neighbor and in a similar manner. This is more important than engine balance from a mechanical point of view, but a fact often overlooked. I attacked the problem by eliminating the disturbing elements from the vapor stream and allowing only a comparatively dry homogeneous vapor to pass into the manifold. This is done by a system of separation and application of local heat.

The temperature of the manifold is of considerable moment, and this was ably dealt with by Mr. Frank A. Howard in his paper before the S. A. E. last winter. He, however, bases most of his deductions on the supposition that the engine runs with an absolute manifold pressure of 0.5 atmosphere. This, of course, would be an advantage from the vapor pressure point of view. My system operates equally well at approximately atmospheric pressure, tests being invariably made at low engine speeds and full throttle opening, a difficult condition for carburetion.

Recent examinations, made by an independent chemist, of exhaust gases from a large four-cylinder engine running on a mixture strength of between 16.8 to 1 at 500 r.p.m., full load, and 16.2 to 1 by weight at 1000 r.p.m., on full load and half load, showed that the combustion was complete in each instance. Mixture strengths of 17.4 to 1 are satisfactorily used, and these weak mixtures will give rapid acceleration; in fact, as compared with the usual commercial set of carburetor and manifold, the Brewer system generally shows an increase in the rate of acceleration up to 33 per cent with a decrease in the fuel consumed for equal work of at least 20 per cent and sometimes as high as 40 per cent.

Examinations of glass manifolds invariably show that there is sufficient liquid on their sides to suffice for as much as 50 cylinder charges. How can one expect to have equal distribution when such a state of affairs exists?

ROBERT W. A. BREWER.

Correction

On page 910 of AUTOMOTIVE INDUSTRIES of April 28 there was printed a letter from C. T. Myers on the subject of Hub Standardization, in which a sentence read in part:

"The Scotch have a gloomy way of regarding the efficacy of remedies that are not mixed in their own pharmacy."

Mr. Myers intended that this part of the sentence should read:

"The doughty Scotch at times have a gloomy way of regarding remedies that are not mixed in their own pharmacy."

The Meaning of the British Coal Strike

Prolongation of the British coal miners' strike may reduce to starvation a large proportion of the population. The momentum of an idea, such as British Labor has, may cause people to rush forward even to the point of destroying the very aspirations for which they are struggling.

By Harry Tipper

THE coal strike in Great Britain continues to drag along with no immediate prospect of relief and with an indication that the other unions are prepared to protect the miners at least to the extent of preventing coal coming into the country if their union orders can do it.

The efforts of the government and the leaders of other unions have failed to bring the mine owners and the workers together, and so far the pressure of public opinion has been unable to effect any basis for further discussion. The stagnation of industry brought about by this strike is very severe, and it will have its effect upon the prosperity of all workers for a considerable time after the strike may be settled.

Great Britain is primarily an industrial country. Its population is more largely industrial than any other country except perhaps Belgium. By far the majority of the workers are occupied in some form of industrial endeavor and as a consequence of this the majority of the working population are members of unions, industrially. Politically, there is a very strong body of socialism paralleling the strong industrial unionism. Despite the fact that the present stagnation of industry will bring a large part of the population to the verge of suffering, if not to actual semi-starvation, the business of forcing the political industrial problems to conclusions is going on and the working population are pursuing these actions, even though they may destroy their prospect of future prosperity for a number of years.

We are very much inclined to forget that the momentum of an idea strongly fixed in the minds of a number of people will rush forward, even though its movement destroys the very aspirations which are back of the adherence to the idea itself. For this reason, the tendency and growth of a new creed in business or politics is very important; more important than the logic of its definition or the justice of its idea.

In the long swing, all such movements tend to equalize themselves and secure a larger measure of justice for the general group, but the long swing in human affairs may involve several centuries. In the meantime, the pressure of strongly organized groups fighting for definite ideas to be put into practice, disturbs the fabric of industry seriously. This disturbance may destroy the efficiency of the industrial accomplishment to a large degree and reduce a percentage of the population to starvation or destroy them. The present coal strike in Great Britain is critical for that reason. It may not be possible to confine the strike to the dispute between the miners and the government as the stagnation of industry grows and the suffering increases.

A good many years ago there was a prolonged struggle

between the foundry men and steel workers and the owners, which affected all the steel and metal trades industries in Great Britain. That strike lasted about nine months. The strike was called after repeated attempts at negotiation and as the result of a complete split on one or two of the matters involved.

During the first two or three months of the strike, the affected workers were quite orderly and no attempt was made to interfere in the operations of some of the companies who employed non-union men. As the time went on and the strike funds diminished, strikers began to suffer in considerable numbers. In some of the towns depending upon the steel industries, the condition of the population was very serious. Sporadic outbreaks occurred, and when the strike was finally settled, a good many riots and other difficulties had disturbed the peaceful character of the dispute.

During the same period a considerable amount of the business went over to Germany, Sweden and other countries and a good deal of capital was transferred to the building of steel plants, foundries and so forth, in those countries. For a number of years the effect of that strike was felt in the position of the British metal trades industries in competition for export markets.

Any large development of suffering from the present stagnation in Great Britain is likely to have its effect in increasing the unrest of the population very materially. The last report indicated that the number of unemployed had reached several million, and each week without a reasonable supply of fuel the number increases.

Distribution will be difficult, even the distribution of foodstuffs will become sufficiently difficult to require severe rationing if the struggle is prolonged. In that case, the bitterness must increase and the population become more and more inclined to take severe measures to relieve themselves of the hopeless situation. It is more and more apparent that the political questions in Great Britain are subsidiary in importance to the industrial questions, and the future position of the country depends very largely upon the settlement of some of these important basic industrial problems.

The Whitley Councils have been of advantage in the settlement of smaller disputes, in the relief from local grievances, and in the interpretation of rules concerning the conduct of the particular industry. All methods of adjustment have failed industrially to meet the situation when the national aims of the trade unions have been at stake and the political aims of the labor party have been concerned.

Developments in Great Britain will have a considerable bearing upon this country; the relation is

too intimate to permit us to be without interest in the matter; especially since upon the stability of the industrial fabric in Great Britain depends the stability of the European Industrial World.

If this strike can be settled by the weakening of the miners or by the reconsideration of the owners, and with reasonable promptness, the settlement and its character will indicate the tendency of labor opinion in regard to its own program and the methods taken to secure it.

If the strike is protracted and the country maintains its orderly condition, it will become evident that the labor party is concerned with pushing some of its political ideas to immediate adoption and that its power is greater than we suspected.

In any event, the coal strike indicates the critical

state of political affairs in Great Britain and the character of its settlement will have an important bearing upon the future policy of the country. It is one of those visible disagreements which accumulate out of years of slow definition, and as such, is likely to indicate the character of future developments more definitely than previous discussions have done.

We were somewhat disturbed in this country when we had a few days with the miners out of the mines, not very long ago. There has been a complete stoppage of coal production in Great Britain for several weeks now.

The stocks are almost exhausted and the unions have put an embargo upon importation. The next few weeks should be critical and important.

Statistics, Necessary and Unnecessary

THE usefulness of statistics and compilations would seem to be the only basis upon which to test the advisability of getting them together. The average business man would regard as a lunatic an automobile executive, for instance, who paid money to an employee for collecting data as regards the number of women with blue eyes in the cities of less than 10,000 population. Yet there are many statistics compiled and many charts kept up to date in various business institutions that have little more actual, practical value to the management than the figures in the example to the automobile producer. As B. C. Moise, secretary of the National Tube Co., put it recently: "Necessary figures are indispensable; unnecessary figures are a pure waste, not only of money, but of what is more important, time and effort."

Along with this statement, Moise made some other very pertinent remarks in an address on "Cost Accounting" before the recently organized Industrial Cost Association. The part of his talk which touched specially on this subject of unnecessary figures is of special interest:

"Costs should be as simple as it is possible to make them consistent with giving all the necessary results. Necessary figures are indispensable; unnecessary figures are a pure waste, not only of money but of what is more important, time and effort. Unnecessary figures tend to confuse the man who uses the costs instead of helping him. I have known some cost men who seem to consider that the object of the cost system was to make figures and not to get results, and as a result they piled up meaningless masses of exhibits which nobody wanted and which nobody could use.

"It should be a principle of every cost department to make only costs which are clearly necessary for the conduct of the business for selling, operating or competitive reasons, and to make no other exhibits which are not asked for as necessary by either the selling or the operating organization. Also, care must be taken to weed out costs or exhibits which have lost their value due to the lapse of time, or which were only meant to serve a certain purpose. I think every large cost department which makes up exhibits in considerable detail should have a committee appointed whose business it would be to go over every single cost sheet, report and exhibit made, at least once every three months, with a view to eliminating those found no longer necessary or those which were not used. A detailed classification on a cost sheet, or a detailed exhibit, may seem admirable to a cost department and may have been urgently requested by an operating official, and yet after the first two or three reports be unused.

"There is no object except expense and confusion in making reports which are not used. It is often the case that an operating official will cling to reports and detailed

exhibits that he never looks at. In some companies, not only are the reports gone over quarterly, but where the accounting official at the mill has reason to believe that the report is not used, it is quietly dropped, and many times, in such cases, the operating official never even notices its lack. It is evident that such reports are only a cause of expense and confusion. I cannot too strongly insist upon the desirability of a periodic review by every company of all reports of every nature, with a view to the elimination of those which have served their purpose, are obsolete, or which are not used to an extent to justify the expense of preparation.

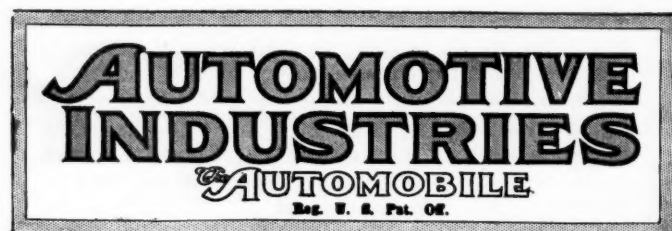
"It seems to be the fashion for the legislative bodies of the National Government and the several States, and also, I am sorry to say, for many well-meaning but misguided eleemosynary societies, to consider that all human ills can be cured by the excessive multiplication of laws and the excessive multiplication of detailed figures. The extent to which miscellaneous information of all sorts is demanded and collected by National and State Bureaus is truly enormous and alarming. As a rule, and I speak from long experience, these reports have very little value of any sort. The data is asked for by people who often do not understand the subject, who have had no training and who are actuated by well-meaning but misguided enthusiasm. That is the charitable view. The other view is that all these unnecessary reports require additional clerks and these additional clerks are not necessarily skilled and trained men, although their salaries add to the taxes which you and I and every corporation pays."

Trades Disputes in Great Britain

THERE were 1715 labor disputes in Great Britain during 1920, an increase of about 300 over the preceding year. The number of persons involved, however, was smaller during 1920 than during 1919. The total number involved in the 1920 troubles was 2,019,000 as against 2,586,000 in 1919.

In 1919 there were 34,903,000 working days lost because of these disputes, but in 1920 the total reached only 27,011,000. A study of the detailed figures as reported by the British Labor Gazette shows the coal miners to be responsible for the most important of these disputes. Nearly a million and a half men were involved in mining disputes; that is, over half the total number involved in all the troubles.

The engineering and shipbuilding trades which caused the loss of 10,000,000 working days in 1919 was responsible for only 2,500,000 lost days during the last year. The miners lost 17,424,000, however, bringing the total up within striking distance of the previous year.



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Growing Popularity of the Line Drive

IN these days of hesitancy among potential tractor purchasers it behooves manufacturers to diligently study all possible means of making their machines more serviceable to the farmer. One feature that unquestionably makes a strong appeal to the average farmer is the line drive. It is not so much the sales phrase that it "handles exactly like a horse," but rather the saving in labor in certain farm operations. The harvest season is always a very busy time on the farm, and if a man is required to ride on the binder in addition to the man operating the tractor, it is a great handicap for the tractor. Although farm labor conditions have been somewhat relieved, the farmer is still under the influence of conditions that obtained during the past couple of years when efficient help was exceedingly rare and expensive and the other kind extremely unsatisfactory.

For operating a manure spreader, for hauling farm wagons and various other operations the line drive is

exceedingly handy. The length of time the tractor is used for such operations may not be very long as compared with the plowing period, but the point is that the extra help required for these occasional operations is not available on the smaller farms.

That farmers think highly of the line drive idea has been demonstrated time and again at shows by the crowds at stands on which such tractors were exhibited. Line drive attachments have also been developed for the Fordson tractor and evidently met with considerable sale.

At first the line drive principle did not take well with the leading tractor makers, who evidently considered it a mere selling feature intended to convince the timid prospect of the ease of tractor operation. Its practical advantages are gradually coming to be recognized even by the more conservative makers, however, and the number of line drive models offered is perceptibly increasing.

New Applications of the Principle Leverage

IT seems that Archimedes, who discovered the law of the lever, thoroughly understood the principles of modern advertising copy writing. If he had enunciated his law in the now familiar text book form—"the moment of the load is equal to the moment of the force"—he would have created hardly a ripple of interest. So he thought up a way of putting more punch into its statement and put it thusly: "Give me a fulcrum point for a lever and I will move the earth."

This forceful enunciation of the simple law has lost none of its impressiveness even to-day, after more than two thousand years, and, enthused by the wonderful possibilities thus indicated, inventive minds are constantly at work in an endeavor to apply the great force of the lever to the solution of some of our every day problems—sometimes with rather startling results. A Montana inventor, for instance, has created a leverage system which he has applied to a well-known make of automobile engine, increasing the horsepower of that engine (we are assured) nearly 100 per cent. The crank throw is said to be different from the piston stroke. In an advertisement of the company promoting the invention, appearing in a Montana newspaper, a number of residents of the neighborhood vouch for the increase in horsepower. It would not be difficult to concede that a leverage system might increase the torque, and the thought occurs that possibly the men who attested the brake horsepower tests do not understand the difference between torque and horsepower or between force and power.

Archimedes' famous statement regarding the possibilities of the lever is quoted also by a Denver concern which has made what is claimed to be a new application of leverage in tractor construction. Instead of hitching the plow to the tractor frame, it hitches same to a crossbar fitted with rollers at its ends which travel on circular tracks secured to the driving wheels and concentric therewith. This is said to transfer the fulcrum point of the drivers from the axle to the

point of ground contact, and thus to prevent all slipping of the wheels. The fulcrum point of a rolling wheel is a rather novel conception. It is quite plain, however, that when a tractor exerts a drawbar pull there must be a reaction to this pull, and this occurs between the wheel rims (and their lugs) and the ground. If the load to which the tractor is hitched is excessive and there is sufficient engine power and a sufficiently large gear reduction, the drivers will slip, no matter how the load is hitched.

The lever will serve very well for multiplying forces, but in the same measure as the force is increased the speed of the motion is decreased and the power (or rate of doing work), therefore, remains the same. By a slightly more complicated mechanism we can even multiply horsepower, but in the same measure as the horsepower is multiplied the time of application is reduced. All attempts to use the principle of leverage for multiplying the power of engines must necessarily end against the stone wall of the law of energy conservation.

The S. A. E. and Research

THE announced intention of the Society of Automotive Engineers to enter actively the research field has been made the occasion of many letters addressed to AUTOMOTIVE INDUSTRIES and pertaining to proposed activities along this line. While some of these correspondents foresee some dangers and difficulties that must be guarded against if the new activity is to succeed, we have yet to hear anything but commendation for the basic undertaking.

It is quite generally agreed that it is necessary to the success of the project to make haste slowly, lest the plan be discredited by ill-considered action or mistakes in policy. Time in planning will not be lost, of course, if this time is used in establishing a sound foundation. One correspondent points out the need for laying out a complete program before conducting any actual research as a means of avoiding the possibility of becoming involved in a mass of details and losing sight of the most important items. It is obviously desirable to start first the items of greatest importance, later elaborating on details in logical sequence.

Another correspondent mentions the fact that few industrial organizations have the funds required for what may be termed fundamental research, but greatly need much fundamental data, now lacking, in order to start specific developments on a sound basis. Such data can, he says, be best developed through research in university and government laboratories, which will gladly undertake the work when it is once agreed what is required. The S. A. E., it appears, can and should be the directing and co-ordinating body, and serve as a clearing house for collection and dissemination of data from all available sources. When data in hand requires checking and when gaps in the available information need to be bridged, the S. A. E. should assign the problem to one or more laboratories, follow it through, and publish the resulting data in convenient reference form.

The belief is quite general that research involving

fuel and its efficient utilization is of primary importance, and there are, of course, many angles to this problem which seem of pressing importance. Some consider that development must take place along lines that will make the automotive engine independent of specialized and high-priced fuel. Study of fuel injection is suggested. Means for controlling temperature inside the cylinder, study of the laws of heat transfer, behavior of various fuels, study of means for producing cheaper alcohol, and many related matters are mentioned as being of importance. One engineer suggests the need for dividing fuel research activities into two parts: those which relate to future designs and those applicable to equipment now in use or in process of manufacture, since much of this equipment will continue in operation for many years to come. It is evident that study of means for improving fuel economy, especially at part load, is needed and should constitute an item of first importance.

The fuel problem so far overshadows other matters of importance that little space is devoted in the letters received to the need for consideration of what may be termed mechanical research, but some draw attention to the need for improving mechanical efficiency, especially in the engine, and for lowering resistance to motion of the car (drawbar pull), while others cite the need for study of factors tending to increase the life of parts and lower cost of operation. In this connection weight reduction and elimination of non-essential equipment are mentioned.

Several correspondents point out the importance of keeping clear of patent considerations in all activities undertaken by those who have the research program in hand. Similar caution in this regard has been observed in connection with S. A. E. standardization work, but it will, it seems, require even greater attention in reference to research work.

There seems, on the whole, to be little question of the hearty support and ultimate success of the proposed activity, if the foundation is well laid and the work prosecuted in a thoroughgoing and persistent manner.

Complicated Practice ; Simple Principles

SOME men who call themselves "practical" are inclined to scoff at those whom they choose to call "theorists." There are so many "practical" men and so many difficulties in industry that it sometimes leads one to wonder whether or not the high proportion of both is not more than a coincidence.

All sound practice is based on theory, and clear, logical thinking in an abstract way is necessary to the development of intelligent practice. Prof. Einstein has said a lot of things that only a few can understand, but he recently made a statement that has a clear meaning and a direct application to the problems of industry. He said:

"Complicated events flow from a few simple principles, and the more we know the fewer and simpler are the principles." But simple principles must not be confused with superficial catch-words or formulas as is sometimes the case.

Bad Weather Leads in Sales Check

Price Uncertainty Is Another Factor

Prompt Action Needed for Stabilization—Wall Street Hysterical Again

By James C. Dalton

NEW YORK, May 16—Temperamental Wall Street is worried again about the automotive industry and is selling motor stocks short. This is its reaction to price cuts, a slight decline in retail sales for April and lower dividend rates. This attitude in the "street" is nothing new and in it there is no new significance.

There is real significance, however, in the remarkable "come-back" of the industry at a time when the entire country is crying depression. Automobiles were one of the first commodities to bear the full brunt of the buyers' strike and they were one of the first to feel the pulse of renewed demand. This recovery in the middle of a prolonged period of deflation proves that the industry is on a stable foundation. Its future is vastly more assured than that of the railroads whose securities once were the chief source of revenue for widows and orphans.

Business in the United States never has been called upon to meet problems exactly like those which it has been compelled to face for the last year, but there never has been a period of depression from which the country has not emerged on an even keel. There have been ups and downs for every line of industry and there will be now.

It was not to be expected that when sales of automobiles began again after the serious slump of last fall and winter they would forge ahead steadily, month by month, with each thirty-day period better than the one preceding. That condition never has prevailed in normal times and it never will. Certainly it could not be expected under the abnormal conditions which prevail now.

Business Largely Seasonal

The automobile business, in its very nature, has been largely seasonal. This applies to commercial vehicles as much as to passenger cars. Until good roads become universal and until snow removal becomes a science this always will be true.

Passenger car sales in all except southern states always increase to a peak in early summer, and there always is a drop in the sales curve about July 1 when the first summer demand has been satisfied. After that sales forge ahead in a satisfying way and business is good in late summer and early autumn, reaching its ebb about the first of the

AUTOMOBILE SALES INDEX TO BUSINESS

NEW YORK, May 14—The following statement in reference to automobile conditions as contained in the monthly review of business conditions issued by the Northwestern National Bank, the largest in the Northwest, indicates the change in sentiment toward the automotive industry on the part of bankers:

"Automobile sales now are looked upon by many as one important index to business conditions. Although the industry is not so basic in character as some that by the rise or fall of their activity affect conditions generally, it has become so great in recent years that its availability for general guidance is more generally recognized."

year when winter has taken its first firm grip. From this ebb the rise begins gradually and spring sees a sharp upshoot in the curve.

The spring demand began this year abnormally early. The winter was remarkably open and the weather for the first quarter was more spring-like than it has been since then. It was only natural, therefore, that sales of cars started from six to eight weeks sooner than they would under the usual weather conditions. Such being the case, it would be remarkable if they did not fall off a little earlier.

Sales at retail were somewhat smaller in April than they were in March. That was due in large measure to the cold, raw weather which prevailed in nearly all sections of the country. It might be pointed out, however, that sales of winter overcoats, which usually start in late October, did not get under way last year until nearly Christmas. The topsy-turvy weather was the reason for that, just as it has been the chief reason for whatever slump there has been in automobile sales for the last month.

Proceeding With Caution

After its sad lesson with huge inventories purchased at high prices, the automotive industry is proceeding with the utmost caution. It is buying on a hand-to-mouth basis. This applies to all branches of the industry. Orders are placed only for goods which are actually needed and prompt deliveries are demanded. Sometimes, the parts makers contend, the demands in this direction are unreasonable. They are again beset by stock chasers.

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Sales Slump Hits Lines Not Reduced

Buying Gains in Cars Repriced Offset by Check in Other Makes

NEW YORK, May 16—With the exception of Studebaker, practically all lines of cars handled in New York have been unfavorably affected by the price reductions on Marmon and Jordan more than two weeks ago, and on Oakland and Chevrolet announced last week. The four cars which reduced have been selling strong, Marmon particularly having made a big gain this week over sales during the first week of the lower priced period. Oakland and Chevrolet sales started with a rush, naturally most noticeable in the latter line, Monday morning following the appearance of the reduced price announcement in the Saturday and Sunday newspapers.

Marmon sales have been so heavy that the accumulated stock of cars has been cleaned out except for three enclosed models. The distributor is even forced to do without the four passenger and seven passenger demonstrators. Orders for factory shipments during May have been largely increased. Marmon distribution outside the city is handled by five dealers, all of whom this week had the largest single week's sales since they took the Marmon representations.

Oakland sales have been multiplied several times in both the New York and wholesale territories. Chevrolet sales are strong throughout the territory and orders are pouring into the factory at Tarrytown. In the New York salesroom the sales force has been practically swamped with demands for attention from salesroom shoppers.

Studebaker Six Weeks Ahead

Studebaker sales, which have increased steadily since the first of the year, have now reached a point where orders are being taken subject to six and eight weeks' delay in delivery. Recent price reductions in other lines apparently have not affected Studebaker in this territory up to date.

Generally speaking, however, passenger car sales have suffered acutely from recent price reduction announcements. In some lines sales have been virtually halted by an attitude on the part of the public which indicates that lower prices are confidently expected. Several of the lines which have been selling strongly for the past month or two have been affected by competitive reductions, sales on some of these popular classes drop-

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Bankers Name New Goodyear Head

E. G. Wilmer Succeeds to Seiberling Place

Stadelman and Litchfield Continue as Vice-Presidents—
Directors Reorganize

NEW YORK, May 16—Edward G. Wilmer of Milwaukee, vice-president of the Steel & Tube Co. of America, will succeed F. A. Seiberling as president of the Goodyear Tire & Rubber Co. under the reorganization plan which became effective when bankers formally took control of the corporation. He is a close friend of Clarence Dillon of the banking house of Dillon, Read & Co. of New York which headed the syndicate of bankers which has successfully put through the refinancing plan under which \$85,000,000 in new securities will be offered. Wilmer, who is only 38 years old, has been identified with the mining, steel and chemical industries. He will move from Milwaukee to Akron and it is said he will have a free hand in the management of Goodyear.

The only Goodyear officers prominent under the Seiberling régime who will remain are George M. Stadelman and P. W. Litchfield, both of whom retain their positions as vice-presidents. Vice-president C. W. Seiberling retires with his brother.

The ousting of F. A. Seiberling from the head of the great tire company which he built up is one of the most dramatic and tragic incidents which has followed the period of depression into which the country was plunged nearly a year ago. The financial difficulties which resulted in his downfall were the result of the enormous inventory accumulated at high prices and the very large number of contracts made for future deliveries of crude rubber and long staple cotton.

Organized With \$12,000 Capital

Seiberling, who is now recognized as one of the leading figures in the rubber industry in the world, began 23 years ago with \$12,000 borrowed capital with which he founded the Goodyear company. From this small beginning the company grew until it became the second largest rubber company in the world with more than 50,000 employees, 100 acres of floor space in its Akron factories, a rubber plantation in Sumatra, tire factories in Canada and California, a 56-acre cotton plantation in Arizona and fabric plants at Goodyear, Conn., and Los Angeles. The company attained a peak production of more than 50,000 automobile, motor truck and motorcycle tires a day. It gave the motoring world

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Seiberling Says He Will Take One Month's Rest and Then He'll Go to Work—at Something

AKRON, May 16—"I am going to clear up my personal affairs next week and then go away for a month's rest. When I come back I shall go to work—at something."

This statement was made to-day by Frank A. Seiberling, who retires as president and director of the Goodyear Tire & Rubber Co., which he founded.

"My brother, C. W. Seiberling, and myself, sever all our relations with Goodyear and control of the business passes into the hands of the bankers as provided in the reorganization plan," he said. "Both of us continue our interest as the company's largest stockholders. For 22 years we have labored together and what has been achieved the world knows. The nation-wide slump in business last fall brought our business to the verge of disaster. Since that hour I have had but one purpose—to save this business from a receivership and this community from the results of such a calamity. That was accomplished yesterday and the new management inherits a business soundly financed."

"My successor, E. G. Wilmer, of Milwaukee, is a young man of fine legal training and broad experience in operating business, and with the return of the world to normal business there is no reason why Goodyear cannot move forward to a higher plane than it has yet achieved. The bankers in control made me an exceedingly generous offer to continue with the business, which, after careful consideration, I felt justified in declining."

"What I am going to do next I do not know. Since I left school 44 years ago I have labored hard, enjoying my work all the way along, through all its difficulties, up to within the period of the last six months. In truth, I have been tired during that period. The burden is now all off my shoulders, except for a few days I have had no vacation in over two years. I am going away for a month's rest and when I come back I shall go to work—at something."

Goodyear Files Show Business Struggles Fought by Seiberling to Win Success

AKRON, May 16—It is interesting to go back through the files of the Goodyear history from the time in 1898 when F. A. Seiberling started the company with a capital of \$12,500, of which only \$3,500 was cash—and that borrowed—and to follow the progress of the concern through years and months of troublesome times, up until the present when Goodyear at its peak a few months back had over 50,000 employees throughout the world.

First Directors Unfriendly

The Goodyear company, housed in ramshackle buildings in East Akron, where now stands the Goodyear plant valued at nearly \$60,000,000, was forced to expand. But expansion meant re-financing and Seiberling presented to his directors plans for the securing of \$150,000 of additional capital. His directors, many of them unfriendly to his personal interests, guaranteed the re-financing upon condition that the Seiberling brothers pledge the majority of their stock, and endorse the notes as evidence of good faith. Willing to make the personal sacrifice for the sake of their concern, the brothers announced the plan as acceptable, until they discovered hidden in the phraseology of the terms, clauses which would have transferred control from the two, robbed them of au-

thority, and practically ousted them from the company.

The directors brought pressure to bear and issued the ultimatum that unless the two brothers surrendered unconditionally, all arteries of financial aid would be completely shut off.

One director who had advanced \$10,000 to meet the company's payroll, demanded instant reimbursement. Goodyear records show that President Seiberling unflinchingly, although he did not know where the money would come from, calmly replied, "I will get your money for you by 5 o'clock."

Appearing before directors of an Akron bank which was none too friendly to him, and yet the only financial institution he could call upon for aid, Seiberling's outspoken frankness was attended by success. By 5 o'clock the turbulent director's \$10,000 was in his hands, his stock was purchased by interests more friendly to the Seiberling brothers, ample credit was secured to endorse the company's paper, and the crisis was averted.

Averted Crisis in 1903

Again in the panic of 1903, Goodyear lived through another serious financial crisis. Approximately \$800,000 of the company's paper, most of it in notes, was

(Continued on page 1081)

Senate Clears Way to Aircraft Dumping

Penrose Takes Position There Is No Air Industry Here Requiring Protection

WASHINGTON, May 16—Efforts of Senator New of Indiana to protect American aircraft manufacturers from foreign competition by a specific amendment to the anti-dumping bill failed Wednesday because Republican leaders insisted that the proposition was utterly indefensible. The New amendment was designed to block the sale here of surplus airplanes by the Aircraft Disposal Co., organized in Great Britain.

In opposing the proposition on the floor of the Senate, Senator Penrose of Pennsylvania, chairman of the Senate Finance Committee, insisted that it was an attempt "to tax the Government of the United States several hundred million dollars for fostering an alleged American industry which is non-existent." Senator New challenged the assertion of the Pennsylvania senator with the statement that 20 concerns are now making aircraft or aircraft parts in this country with great opportunities for expansion because of the commercial demand for airplanes.

Senator New pointed out that 100 airplanes were imported to this country after the armistice for sale here, but were not put on the market because of the effective campaign by American manufacturers. These aircraft producers appealed to the United States Court, and the court held that the British planes were based upon an American patent and did infringe upon that patent. He insisted that these planes are now in bonded warehouses at eastern ports ready to be put on the market here at any figure that their American owners can get for them.

The Senate was advised by Senator New that 30 concerns were making airplanes and about 20 others making aeronautical motors at the time of the armistice, representing a capital investment of \$100,000,000 and employing 200,000 operatives. He declared that there was now perhaps a total of 2500 operatives within the industry hoping to remain in the field if not pushed out by foreign competitors.

He declared that manufacturers will not be warranted nor able to attempt to revive the domestic market until they receive ample protection.

See Plane Dumping Move in Handley Page Visit

NEW YORK, May 16—The Aero Club of America and its affiliated organizations in the principal cities of the United States have called the attention of President Harding and the Secretaries of War and Navy to the arrival in this country of Frederick Handley Page,

head of the British syndicate organized to dispose of surplus aircraft. It is his purpose to sell a large part of this equipment in the United States.

Successful litigation by American owners of patents used in British machines has interfered thus far with the sales. It is expected, however, a new effort to get business will be made coincident with the defeat of an amendment to the anti-dumping bill offered by Senator New. This amendment would have provided that the appraisal value of aircraft imported into this country should be based on the cost of production rather than on the 1 per cent of the original cost which the British interests paid for the war material. This amendment was defeated by Senator Penrose who asserted there was no American aircraft industry worth mentioning and that the United States should go to England for its airplanes if it could get them more cheaply there.

Slough Trading to Sell Trucks in South America

LONDON, May 2 (By Mail)—Plans of the Slough Trading Co., Ltd., for exporting to the United States a large number of the American made motor vehicles bought from the British Government have suffered a serious setback because of the opposition from American truck makers. Many of the trucks which had been stored at the Slough depot were requisitioned by the Government in connection with the threat of a strike by the "Triple Alliance," but as the strike did not take place they were not used. All the vehicles have been reconditioned and the company expects to ship a considerable number to South America, especially the Argentine.

The company has an enormous quantity of spare parts and the prices can be judged from the fact that new Packard cylinder blocks were quoted at \$125. Lucas lighting generators, the normal price of which is \$100, are marked at \$20 in lots of 10.

The general use of the straight side tire makes them look like the British standard, but the fact is more of a tribute to successful American competition than to any recognition of the superiority of this type of tire. There has been a big drop in tire prices but there is little trade because so few vehicles are being built.

Strike Ties Up Daimler

The Daimler works at Coventry are almost at a standstill because of a wage dispute with the 1700 workers. The company's employees had been working on a premium bonus system and not on direct rates for piece work until it was proposed recently to introduce a new line of work with the object of increasing sales and providing more employment. This is believed to refer to a lighter and cheaper Daimler car.

The union objected to this plan, claiming that the standard time rates were affected by the proposed revision. It was contended the proposal would re-

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Experts to Teach Parts Units Service

Factories Launch Campaign to Improve Conditions — Will Tour Principal Cities

DETROIT, May 16—Demonstration lectures to service managers, mechanics and others concerned in the repair and servicing of automobiles and trucks will be given in various cities, beginning tomorrow with a lecture at the Cadillac service station here under the auspices of the Detroit Automobile Dealers' Association. The lectures have been arranged through the efforts of Harry G. Moock, manager of the N. A. D. A., and officials of Continental Motors Corp., Timken-Detroit Axle Co., and Borg & Beck. An expert from each of these companies will lecture on proper servicing of those parts and will give demonstrations in repair work.

Experts employed by other manufacturers of standard units will be added as rapidly as is possible and it is hoped to extend the work to cover every large distributing center in the country. In each case the local dealers' association will have charge of arrangements for the lectures, bearing the necessary expense and attending to the work of bringing out a full attendance of those sought to be reached.

Two nights will be devoted to each city and the itinerary of the lectures following the Detroit meeting will be Cincinnati, May 19 and 20; Indianapolis, May 23-24; St. Louis, May 31-June 1; Kansas City, June 3-4; Omaha, June 6-7; Chicago, June 9-10-11, and Milwaukee, June 13-14. A change in the schedule to include Minneapolis is probable. There will be no sales or advertising propaganda used in connection with lectures.

Draymen's Association Asks Service Stations

LOS ANGELES, May 17—The Southern California division of the Draymen's Association has adopted resolutions requesting manufacturers of complete unit parts to establish parts stations at which genuine parts can be purchased at fair and uniform prices for the units now being manufactured as well as those which are considered obsolete. This method, the resolution asserts, is the only practical way in which motor truck users can get the service to which they are entitled.

The assertion is made that past experience demonstrates that distributors and agents either cannot or will not carry a complete stock of parts. Another difficulty, it is stated is that manufacturers are constantly changing their representatives as well as their models and that as a consequence members of the association constantly are finding themselves with broken down equipment because no one carries the parts needed.

Du Pont Finances G. M. C. Purchase

Will Sell \$35,000,000 in Gold Bonds to Close Transaction with Durant

NEW YORK, May 16—The stock transaction in which E. I. duPont de Nemours & Co. purchased control of the General Motors Corp. from William C. Durant, formerly its president, in the liquidating market of November, 1920, is to be financed permanently by an issue of \$35,000,000 7½ per cent 10 year gold bonds.

J. P. Morgan & Co. have purchased the issue from E. I. duPont Nemours & Co. and will offer it today through a nationwide syndicate at 100 and interest to yield 7½ per cent. The bonds, dated May 1, 1921, are redeemable at the option of the company, in whole or in part, on 60 days' notice, at 110 and interest, at any time prior to May 1, 1922. Thereafter the redemption price decreases 1 per cent yearly.

The formal announcement of the banking house said:

"The proceeds of the bonds will be used partly to supply funds for permanently financing the cost of the common stock of the General Motors Corp. purchased last year and for other corporate purposes."

Approximately \$25,000,000 will be required to finance the stock transaction permanently. The additional \$10,000,000 is for corporate purposes.

This General Motors stock now held by the duPont Securities Co. amounts to approximately 4,000,000 shares in all. A total of 2,504,273 shares was acquired by purchase from William C. Durant in November for \$23,790,600 in cash and 40,000 shares of the duPont Securities Co. Subsequently, the duPont Securities Co. gave Durant 230,000 shares of General Motors common stock for his 40,000 shares of duPont Securities Co.

To Wind Up Holding Company

It was said yesterday by the bankers that the affairs of the DuPont Securities Co., formed temporarily to hold control of General Motors, would be wound up. Its assets will be taken over by the DuPont American Industries, Inc., whose capital stock is owned entirely by E. I. duPont de Nemours & Co. Into this concern's treasury will go \$7,000,000 of General Motors stock; \$20,000,000 of the preferred stock of the duPont Securities Co. and all of its common stock, under a trustee arrangement. The DuPont American Industries, Inc., in turn, will issue \$25,000,000 of its bonds to the parent powder company.

It was made plain by the bankers that the General Motors Corp. was not identified with the current financing in any way, and that its mention came only because a sale of this particular stock needed financing. It was made plain by

the bankers, too, that the control of General Motors was vested in E. I. duPont de Nemours & Co. and that the stock would not again come on the market. The Street has heard rumors that the purchase of the stock at forced sale was a temporary expedient and that some of it might be resold in the open market to reimburse the purchasers. These reports are set at rest by announcement of the permanent financing.

G.M.C. Stockholders Increase to 58,000

NEW YORK, May 13—Stockholders of the General Motors Corp. now number more than 58,000. This is an increase of approximately 30,000 in the number of common shareholders, which is regarded as significant in view of business conditions in general and the automotive industry in particular during the past eight months. This number does not include the holdings of individuals standing in the names of brokers and bankers.

The tabulation shows that investors own 18,860,881 shares of General Motors common, an increase of 4,694,257 in a year. The number of common stockholders at the beginning of May, 1920, was 7193, and it is now 37,991. The increase in the number of holders of preferred and debenture stock has been much less marked, growing from 18,943 to 20,833 in the year. An indication of the extent to which the floating supply of General Motors common is being absorbed by investors is seen in the fact that among stockholders owning from one share up to 200 shares there has been an increase of 130,000 shares in the last three months.

G. M. C. TO RENT OFFICE SPACE

DETROIT, May 14—The executive committee of General Motors Corp., has approved the rental of the second and third floors in the east half of the building, to outside firms or corporations. This gives approximately 50,000 sq. ft. of floor space which the announcement says can be made ready for occupancy by July 1. For a time it was the intention to devote the entire building to General Motors interests and many applicants for office space were turned down. Since the change in management however several changes in the policies of the company have been announced and the proposal to rent office space is the latest. Persons who had applied for space are being notified that they can be accommodated.

CHEVROLET PRODUCTION RISES

FLINT, MICH., May 14—The local plant of the Chevrolet Motor Co. began increasing its force at a rate which is expected to add 1500 men within the next two weeks with all departments operating on full time. General Manager C. F. Barth said the increased operations were due to greatly increased sales demand following announcement of the recent price reduction.

Lay High Insurance to Moral Hazards

N. A. C. C. Committee Would Eliminate Loose Methods in Accepting Risks

NEW YORK, May 17—The insurance committee of the National Automobile Chamber of Commerce, of which W. E. Metzger is chairman, has sent to its members a bulletin declaring that in its opinion the present high rates are due to the loose methods in accepting risks and that insurance companies "should scrutinize the moral hazard." The bulletin says:

"The cost of insurance to car and truck users has mounted steadily. In the belief that this is very largely due to loose methods on the part of insurance companies in accepting risks regardless of moral hazard we have taken the position, in public statements on this question, that underwriters should scrutinize the moral hazard, and that in the meantime mutual insurance companies which cover the public at much less cost are to be encouraged.

"Accidents are not prevented by liability insurance, which, on the other hand, tends to promote recklessness. The amount of fire and theft coverage allowed on cars and trucks, particularly after the first year of their use, frequently exceeds actual value; this minimizes care and encourages their being destroyed and reported as stolen by unscrupulous owners. These costs are spread over the policies of the great majority of responsible owners.

"The new plan of grouping cars according to construction features determines comparative rates but can have little effect on total fire losses, since a very small proportion occur from integral causes. It does not go to the main point of reducing total costs to the public, which is of direct interest to manufacturers.

"According to figures given out by 131 insurance companies, the fire and theft premiums received by them in 1920 amounted to \$74,472,250. The losses paid amounted to \$42,935,748.

While manufacturers are carefully studying the schedule of hazards of the underwriters' laboratories, in which are listed features of construction considered by underwriters to have a bearing on risk, we are presenting the point of view that while this may be helpful, it offers little hope of any great reduction in the average insurance premium per car."

Makers Consider Company

NEW YORK, May 16—The *Eastern Underwriter*, an influential insurance newspaper, says: "It is reported that automobile manufacturers are discussing the advisability of forming an insurance company or companies because of the high automobile rates, which are reacting in car production. Some people are not buying cars because they cannot afford the insurance."

Weather and Prices Lead to Sales Check

Nobody Caught Napping Through Business Slackening—Price Situation Expected at This Time

(Continued from page 1076)

Production schedules for automobile factories are based largely on the business done the previous month. Under the conditions which prevail at present, if the sales for April fell below the mark expected, the schedule for May will be cut. Factories now are making only enough cars to meet actual demands.

The fundamental soundness of the industry has not been affected, however. The industry daily finds itself more solid than it has been for months and much of this solidity is due to the fact that nearly every condition that arose within the last year had been foreseen and the leaders of the industry are still far in advance of the present situation.

A falling off in sales at this time has been expected. Nobody has been caught napping. In fact, AUTOMOTIVE INDUSTRIES, which has chronicled in advance most of the moves and trends of the past year, has had in its office for some time a report from the national sales field, indicating that the encouraging upward swing of sales in the spring would not continue unbroken.

It has been known for months that a price situation was inevitable about this time. When prices broke last fall the industry adopted a stabilizing policy of making immediately any changes that were to be made. Numerous prices were adjusted and those that were not changed were guaranteed until about this time. That stabilization helped materially during the winter months. Now the next step in the readjustment has been reached and what is needed is stabilization as quickly as possible. Those who are going to adjust should do their adjusting early and help set the stage for a continuation of selling. Until the adjustment is made sales will be more difficult, for the public will not buy on a continuously falling market. Those who are not going to cut should say so and the rest should change their prices and have it over with.

Buyers Waiting Stability

Reports from the entire country say that buyers are ready to hold off until prices seem stable and there is a feeling that there will be good business in the last half of the summer and during the fall if the stabilization can be effected quickly. Sales of the entire industry will be affected if the companies adjust, one by one, for the rest of the summer.

Price must be taken into consideration in the present situation. Cars which show value for the money are having good sales and have had. Some cars may be comparatively over-priced and it is not a perhaps remote possibility that the 1921-22-23 profits of some companies for the term of years might be greater if

adjustment to conditions were placed first and full profits second for the remainder of the present year. A healthful readjustment to a basis that would require little change for months to come would be beneficial. Keen students believe the peak of sales in the industry has not been reached and that the next few years will be the greatest ever seen in motor vehicle sales.

Stabilization of prices on all products is also essential. The agricultural areas are affected by the relation between farm product prices and the prices of other commodities and in many general items, such as are sold in department stores, even the proprietors of the stores are having trouble forcing their own prices down. Incidents have been found of department managers who mark goods even higher than the store owners desire in order to make the particular department show up well in the total store profits, in which the department manager, of course, participates. It is not possible to know how extensive such cases are, but they are regarded as an evidence of the lingering desire of the man who tasted war profits not to loosen his hold on the joys of the hey-day period. A recent conference in Washington of the National Conference of Business Paper Editors developed considerable information of this character.

Some Banks Antagonistic

In some sections, particularly the southwest, the old score between the automobile industries and the banks remains to be wiped out. It does exist. A bad impression still prevails and much good is expected to come from an address which Governor W. P. G. Harding of the Federal Reserve Board is to make in Kansas City May 21.

Reports gathered from the national field show instances of dealers who are getting more business than might be expected because of more intensive sales work. One dealer is holding his volume to normal but is using three times the usual number of salesmen to do it. Another dealer is taking cars in the rough and producing what is practically special models in color, and he makes the point that no matter what happens the dealer who works will still get some business.

Most interesting in considering the future is the statement by one student of affairs that when the world gets back to working and buying we shall have a new crop of buyers.

Reparation Terms Important

A potent factor in the return of better business is the recent acceptance by Germany of the reparations terms. It is the most important move toward world prosperity since Nov. 11, 1918, and the handling of the subject in the daily press has not been at all in accordance with what the acceptance means to the workers in American factories. England, as she has done for hundreds of years, undoubtedly will extricate herself from her present trouble with no disastrous consequences. Russia will always be a sore spot until her people return to productivity.

Dallas Car Registry Tallies with 1920

Figures for April Both Years Is 573—Other Texas Cities Report Activity

DALLAS, TEX., May 16—That the automobile business has about returned to normal in Dallas is clearly indicated by the number of new cars registered, according to dealers. During the month of April, 1920, a total of 573 new automobiles were sold and registered in Dallas County, and by a coincidence, 573 cars were sold and registered in Dallas County in April, 1921. The majority of the cars sold are priced from \$1,200 to \$2,500.

Dealers in Fort Worth and Wichita Falls declare business during April better than for the same period last year. From other north Texas cities and towns like Greenville, Sherman, Paris, Denison, Corsicana, Gainesville, Denton and Terrell, dealers report business improving. Accessory and repair men in these places make similar reports. The truck business appeared to suffer a slump during the past month. This is believed to be due to the heavy truck tax law which becomes effective in July.

Sales Slump Hits Lines Not Reduced

(Continued from page 1076)

ping off from 25 to 50 per cent during the past week.

Salesmen report a much wider use than formerly of the "prices have got to come down" argument by prospects who seem to be sold on the cars offered them but absolutely refuse to sign contracts. Several dealers in lines guaranteed to mid-summer have found the guarantee of little avail in the face of present conditions, prospects in a good many cases declaring that they will "wait a couple of months and see what happens." Distributors of cars which have been subject to recent price reductions are "making hay while the sun shines."

Chicago Finds Tendency to Wait Lower Prices

CHICAGO, May 17—While sales are being made in this territory there is evidence of a holding back on the part of many prospects due to the recent cut in the prices of some automobiles and the resultant questions that they raise in their own minds of how extensive this price reduction will be—if it will not, within the course of a few weeks, reach most of the lines. The same feeling of hesitancy that appeared last September when the price reductions started is again noticeable.

This feeling is true particularly among those prospects who would buy cars in the classes where a guarantee of price has been made.

Goodyear Files Show Route to Success

(Continued from page 1077)

in the hands of bankers scattered throughout the country. To cap the climax the company's chief endorser was himself plunged into financial difficulties and made plans to leave the country. President Seiberling and his brother, securing a list of notes and waivers of endorsement, started in opposite directions to seek extension of all loans.

While returning from New York, Seiberling evolved the strategic plan of selling the business, or at least of securing a contract for sale, for to have negotiated a sale within the limited time necessary in order to meet the notes was impossible, as one-third of the \$800,000 was due within three weeks. He returned to Akron with a contract calling for the sale of the Goodyear business to a rival concern upon terms which would pay stockholders a substantial amount on their holdings, as his weapons with which to stave off impending ruin.

To add to his tribulations came the sudden death of his father. But undaunted he went before the directors with his contract. Pinning their faith in his ability, although deploring the thought of selling the business, the directors instantly approved any step he might deem necessary to meet the exigencies of the occasion. But the directors did not know that selling the business was the least of Seiberling's thoughts until he told them he would use it merely as a defensive weapon to stay the hand of impatient creditors.

"With this document," he said before that memorable meeting seventeen years ago, "I shall gain added confidence, secure extension of all loans, and even get those same creditors to loan us more money."

The two brothers then started out. There were 155 creditors scattered throughout the country, to be seen personally. And after weeks of traveling, the brothers returned, with faces wreathed in smiles, for the creditors, impressed by their frankness and past record of achievement, gave them the added confidence sought and provided the additional financing required.

Grew to 80 Unit Plant

From that time Goodyear grew rapidly. The Akron plant of eighty buildings comprising one hundred acres of floor space, had over 31,000 employees and a capacity of 35,000 tires daily. Goodyear had 74 branches scattered throughout the world.

Sales were \$69,000 in 1910, jumped to \$169,000,000 in 1919, and exceeded \$200,000,000 last year. Every year since 1903, the officials, with substantial uniformity, were able to state in annual reports that "the past year's business has been the largest and most successful in volume and profits of any year in the history of the company."

For the first six months of the fiscal year beginning Nov. 1, 1919, Goodyear business was running 59 per cent greater

than for the same period of the year before, with the demand for product far beyond the company's ability to supply. This entailed financial requirements beyond normal and the company offered to stockholders two shares of preferred and one of common stock at par, selling thereby \$27,794,700.

Then came financial deflation, the tightening up of credit and slowing down of the automotive industry, with resultant lull in tire sales. Retrenchment became necessary and additional financing became imperative, this latter being accomplished by providing in new money and extension of bank paper \$28,800,000 maturing February 15, 1921. The process of readjustment and deflation affecting all lines of industry proved especially severe to the rubber industry, raw materials, including both rubber and fabric having in a few months dropped in value over 50 per cent. This meant a loss to the company on contractual obligations of \$19,000,000, in addition to the deficit of \$15,047,653.56.

November was the low ebb of Goodyear operations. Business then began to pick up and sales increased encouragingly.

The company's annual statement listed the value of the Akron plant at \$57,913,143.46 and the Sumatra rubber plantation at \$5,003,257. Investments in and accounts due from domestic subsidiary companies wholly owned were \$13,352,158 with \$21,179,529 listed as due from subsidiaries not wholly owned, and \$4,393,217 due from foreign selling subsidiary corporations.

The annual statement also showed that an account of \$3,568,445 due the company from President Seiberling had been closed by Seiberling depositing as security 75,000 shares of \$7,500,000 par value in the Akron, Canton and Youngstown Railway Co., and 250 shares in the East Akron Land Co., the Goodyear Co. thereby taking over one-half ownership in the railway and taking over the Goodyear athletic field of thirty acres, owned by the East Akron Land Co.

Dunham Heads Division on Axles and Wheels

NEW YORK, May 17—The Council of the Society of Automotive Engineers has appointed an Axle and Wheel Division to consider the question of standardization. G. W. Dunham of the Savage Arms Corp. is chairman of the division, and the other members are: C. C. Carlton, vice-chairman, Motor Wheel Corp.; T. V. Buckwalter, Timken Roller Bearing Co.; R. J. Burrows, Clark Equipment Co.; J. Coapman, Russel Motor Axle Co.; C. S. Dahlquist, Standard Parts Co.; Eaton Axle Div.; F. W. Gurney, Gurney Ball Bearing Co.; Geo. L. Lavery, West Steel Casting Co.; A. M. Laycock, Sheldon Axle & Spring Co.; C. T. Myers, consulting engineer; A. L. Putnam, Detroit Pressed Steel Co.; J. G. Swain, Firestone Steel Products Co.; G. J. Thomas, Duplex Truck Co.; H. Vanderbeek, Timken Detroit Axle Co.

E. G. Wilmer Succeeds to Seiberling Place

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the pneumatic tire for commercial vehicles.

The interests which now control the company have elected the following directors: J. P. Cotton of Franklin, McAdoo & Cotton, New York; P. W. Litchfield, Akron, Grayson, M. P. Murphy, New York; J. R. Nutt, president of the Union Trust Co. of Cleveland; Robert C. Schaffner of A. B. Becker & Co., Chicago; A. A. Schlesinger, president of the Steel & Tube Co. of America, Milwaukee; G. M. Stadelman, Akron; Ralph Van Vechten, vice-president of the Continental & Commercial Bank of Chicago, and Edward G. Wilmer of Milwaukee.

The directors elected H. H. Springfield as treasurer and Charles A. Stillman as secretary.

The reorganization of the board was the next to the last step in the rehabilitation of the financial affairs of the company, which has been attempted by the bankers. The first was in the offering of an issue of \$30,000,000 of 8 per cent bonds. This last, to be taken within a few weeks, will be the offering of an issue of \$27,500,000 of 10-year debentures, most of which, it is expected, will be subscribed by present stockholders.

Bankers for the company said that the raw materials now on hand had been written down to current market prices, that the factory at Akron now was turning out 19,000 tires per day, and that the outlook for the corporation under the new management was very promising.

Seiberling was in New York but did not attend the meeting. Officials of the corporation said that any comment about the removal of the former president from the board and from his position would have to come from him.

New Incorporation Filed

COLUMBUS, May 16—The reorganized Goodyear Tire & Rubber Co. of Akron has filed articles of incorporation with the Ohio secretary of state.

The articles provide for \$140,010,000 of preferred capital stock and 1,500,000 shares of non-par common stock. In all, there are 2,910,000 shares of both classes of stock. The fee paid to the state was \$290,010, the largest ever received by Ohio from a corporation for this purpose.

The reorganization scheme also provides for \$30,000,000 8 per cent, 20-year first mortgage bonds, and \$30,000,000 8 per cent 10-year debentures. The preferred stock is divided into three classes—\$40,000,000 8 per cent prior preferred; \$100,000,000 7 per cent ordinary preferred, and \$10,000 6 per cent management preferred.

Mathews Cuts Light Price

SANDUSKY, OHIO, May 16—Mathews Engineering Co. has reduced the price of its farm lighting plant \$150, the new price to be effective at once.

Austin Gets Funds from Private Source

Will Put Business on Satisfactory Basis If Creditors Approve— To Reduce Plant

By Cable to AUTOMOTIVE INDUSTRIES

LONDON, May 16—The Austin Motor Co. has arranged a private loan, subject to approval of its creditors, to put the business on a satisfactory basis. As a consequence the stock of the company is expected to react favorably. There is every likelihood of the proposal being accepted.

Argument in the High court for the compulsory winding up of the company's affairs has been postponed until May 31. Creditors whose claims are considerably in excess of \$1,000,000 opposed the petition and asked for an adjournment.

Production at the Austin plant has not been suspended and there is no probability that it will be. It is likely, however, that the size of the plant will be reduced to something like the possibilities of the business.

Sir Arthur Whinney has been appointed receiver of the Austin company. During the war he acted as advisory to the Admiralty on costs of production and later as assistant accountant general to the navy. The receivership will be continued as long as necessary to reorganize the company's finances.

There is no disposition on the part of the industry in Great Britain to condole with Sir Herbert Austin on the state of affairs of his company. To the contrary he is being congratulated on the fact that financial control has passed temporarily into other hands. He is an experienced engineer and it is the firm belief that his company eventually will be placed on a solid basis.

At a private meeting of creditors Friday, Whinney reviewed the situation. He said the company had come to the end of its resources, that it was being sued, that it had no money to carry on and that the sheriff was in possession because of claims aggregating \$200,000 filed by 26 creditors.

1920 Profits Over Million

The turn-over in 1919 was \$12,500,000 and the profit was \$1,290,000. The profits in 1920 were more than \$1,000,000. The falling off in business in recent months was accounted for by the slump in trade. The present position of the company, Whinney said, was good as regards the reputation of its cars and the demand is greater than can be met under existing conditions. The output for the week ending May 14 was 77 cars. The value of the output for the first five months of this year was \$3,935,000.

After considerable discussion by the representatives of creditors and on motion of the representative of the Dunlop Rubber Co., acting for creditors whose claims aggregate \$2,000,000, the meeting was adjourned and a committee of

six was appointed to confer further with Whinney.

The principal creditors disclosed were Van Dervells, for starting and lighting sets, \$442,500; Fellows Magneto Co., \$150,000; North British Lumber Co., \$235,000; Dunlop Rubber Co., for tires, \$169,500; Ransome & Marles, for ball bearings, \$146,500; Birmingham Aluminium Castings Co. and Midland Motor Cylinder Co., \$149,300.

A similar petition for the winding up of the affairs of the Harper Bean Co. is opposed by creditors having claims aggregating \$2,750,000 and arguments in this case have been postponed for six weeks. This company also is in limited production and while prices of its stock are low they are firm.

The Dunlop Rubber Co. has registered a mortgage to secure \$30,000,000 in 8 per cent first mortgage debenture stock payable at 105. The stock is secured by the company's property.

Stinnes Pushes Work at Fiat Tyrol Plant

WASHINGTON, May 13—Negotiations between the Fiat Co. and a German group headed by Hugo Stinnes with regard to the shares of the Alpen-Montan Gesellschaft, control of which was acquired some time ago by the former, are explained in a communication received by the Bureau of Foreign and Domestic Commerce from Commercial Attache H. C. MacLean of Rome. According to a press dispatch from Vienna, it is stated, the Italian and German groups will exercise a joint control over the company on the following conditions:

"The Fiat will turn over 200,000 shares at a price of 1000 marks each to the German syndicate, which includes the Rhein Elbe Union, the Deutsch Luxembourg, the Gelsenkirchen, the Siemens-Schuckert and the Rochumer Verein, representing a combined capital of over 1,000,000,000 marks. On the other hand, the Fiat will retain 50,000 shares which it has held since 1919. It is said that Hugo Stinnes and Vogler, the general manager of the Deutsch Luxembourg, will become members of the board of directors of the Alpen Co., and that four German engineers have already left for the Tyrol where the six blast furnaces of the company, only one of which is now active, will be put in operation."

RENAULT BUILDS NEW TRACTOR

PARIS, May 3 (By Mail)—Renault, who has specialized on a creeper type of farm tractor since the war, has just put on the market a new four-wheel type machine. The tractor has the same engine as the old type, with four 3.54 x 6.30 in. block-cast cylinders and same thermo-siphon cooling arrangement with radiator placed back of the engine. Transmission to the rear driving wheels is through a cone clutch, three-speed gearbox, and by live axle with planetary reducing gears in the wheel hubs. This type of final reduction has been employed on Renault 7-ton trucks.

South African Show Brings Trade Boom

Dealers Stage Exhibits in Sales- rooms After Difference with Agricultural Promoters

JOHANNESBURG, SOUTH AFRICA, March 28 (By Mail)—The annual Johannesburg automobile exposition was held this year in the showrooms of the dealers themselves instead of in the automobile section at the Agricultural Show in Milner Park. All preparations had been made to take part in the fair as usual until it was found that the executives of the Agricultural Society took the position that it was their privilege to let space to certain dealers without reference to the body of motor traders of the city. The dealers thereupon decided to hold their exhibition in their own buildings and the only cars represented at Milner Park were the Nash and the Allen.

The buildings devoted to automobiles were thronged by visitors show week. For a considerable time it has been the contention of many dealers that the advertising value of the show at Milner Park did not repay them for the expenditure involved, and it almost seems that this contention is correct. It is certainly true, however, that numbers of country visitors have lost the opportunity of seeing the different models and in this way the country advertising has not been so widely spread.

The new Wolseley models—10 hp. roadster, 15 hp. touring, 10 hp. coupe and 20 hp. touring—have evoked a great deal of praise, and the exhibit made by the agents, Walker & Co., deserves every credit. The Willys-Knight models on view at the showrooms of Consolidated Motors have been a source of much admiration. The sedan has especially come in for approbation.

The "Silver Queen" (a Buick model in silver) has been the talk of the city. The engine is finished in aluminum and the body in silver. It certainly is a showy piece of work and has been the means of attracting numbers of buyers.

Cars Gain in Popularity

The trade has been experiencing a week of good business, and after the displays are things of the past they hope that the boom in cars will continue. There is ample scope in South Africa for automobiles and the population is coming to a fuller realization of the utility of the internal combustion engine as time goes on.

Only ten years ago the number of cars in this country was very small, but to-day, per head of population, the figures have increased enormously and out of proportion to expectations. Trucks sales ought to be brisk during the winter months, as the demonstrations at Milner Park have brought home to the farming community the value of fast, efficient transportation. Tractors are being favored and sales are encouraging.

Off to New Start, Maxwell Reduces

Price Cut First Step by Chrysler
After Court Confirms Sale
—New Officers Named

DETROIT, May 18—The Maxwell-Chalmers reorganization committee, headed by Walter P. Chrysler, came into control of the property of the two companies to-day through confirmation of the sale of the Maxwell plants last week under Federal Court decree.

The first act of the committee after the decision of Judge Tuttle confirming the sale was the announcement of a price cut of \$150 on Maxwell cars. This is the second reduction in a year, taking prices back to the 1917 standard. The touring car and roadster now sell for \$845, the coupe for \$1,445 and the sedan for \$1,545. Chalmers prices will remain unchanged for the present.

A. E. Barker, general sales manager, said no announcement would be made of the personnel of the new organization until after the organization meeting of the Maxwell Motor Co., recently incorporated in West Virginia. President W. Ledyard Mitchell remains as receiver of the Maxwell company pending his final discharge.

In confirming the sale and dismissing petitions of R. R. Rogers and H. H. Webb on behalf of themselves and other first preferred stockholders, Judge Tuttle gave the attorneys two options. One of them was to place in control of the court 180,000 shares of class B stock not yet allotted for allocation to the intervenors if it was found they were entitled to a greater share than the reorganization plan gives them. The other option was for the committee to enter its appearance, which would constitute a practical assumption of liability for the protection of protesting stockholders. The attorneys elected to accept the latter plan and entered an appearance for the committee. Judge Tuttle then confirmed the sale. Lawyers for the petitioners intimated that an appeal would be taken but the attorneys representing the reorganization committee regard the confirmation as final.

Executive Offices Busy

Under the plan the new company will have \$15,000,000 in new capital, and preparations already are under way at the plant to increase production. The executive offices at the Chalmers plant which have been practically deserted for some time teemed with activity this morning, and representatives of material men swarmed the office seeking new business.

Several changes in the personnel of the Maxwell-Chalmers organization already have been announced. H. C. Reichel, who has been in charge of factory service for Chalmers, has been made service manager for both Maxwell and Chalmers. A. E. Richmond, for several

years in charge of Maxwell service at the factory, has been appointed supervisor of the San Francisco district for Maxwell-Chalmers. R. E. Thompson, former chief inspector for Maxwell-Chalmers, has been made special sales supervisor for both companies, with temporary headquarters at Detroit. Theodore Koerner has been named superintendent of inspection, having general charge of inspection in all Maxwell-Chalmers plants, and Leonard Vandersall, who for the last seven years has been connected with the company, has been made South African special representative for the export department. Mr. Vandersall sailed for his new territory May 12.

Dort Drops Prices as Costs Decrease

DETROIT, May 17—The Dort Motor Car Co. announces a price reduction ranging from \$100 to \$180 effective to-day. Touring and roadster models are reduced from \$1,215 to \$1,115, coupe from \$1,865 to \$1,685, and sedan from \$1,995 to \$1,835.

"These reductions are on the new model introduced in January," said J. D. Mansfield, general sales manager, "as the new Dort is not a pre-war car and we are not trying to establish pre-war prices for there is not a pre-war standard from which to judge these new models. The reduction is due solely to the fact that we have reached a production basis that enables us to operate on a lower overhead per car built."

Hupp Prices Reduced \$200 to \$325 a Car

NEW YORK, May 16—Effective to-day prices on Hupmobile cars are reduced \$200 to \$325, the smaller cut being made on open models and the larger on enclosed. Under the new scale of prices the roadster and five-passenger cars are reduced from \$1685 to \$1485; the coupe from \$2725 to \$2400, and the sedan from \$2800 to \$2485.

STERLING PRICES REDUCED

NEW YORK, May 16—Prices on Sterling tires and tubes have been reduced 15 and 20 per cent, the minimum cut being made on Ford size fabric tires, and the 20 per cent reduction being made on all other fabric and cord tires, and on gray and red tubes.

FUEL PRICES HELP BUSINESS

NEW YORK, May 16—The leadership of the oil companies in reducing prices is being hailed in motor circles as a basic move in reconstruction which will permit lower costs of doing business. With 60 per cent of the total gasoline consumed used for business purposes, it is pointed out that fuel prices have a direct bearing on the cost of doing business. With refineries closing down for lack of business it is regarded as a certainty that lower prices will continue to reign indefinitely in the gasoline field.

VerLinden to Join Durant Enterprise

Will Resign Presidency of Olds
Units of General Motors—
Noted as Executive

DETROIT, May 18—The General Motors Corp. announced to-day that Edward Ver Linden has been relieved of his duties as general manager of the Olds Motor Works and that A. B. C. Hardy has been appointed acting general manager. Hardy is one of the veterans of the General Motors organization and has held many positions of responsibility.

DETROIT, May 18—Edward VerLinden soon will retire from the presidency of the Olds Motor Works at Lansing to join forces with W. C. Durant, it has been learned here. His resignation has not been filed and no date has been fixed for his departure from the General Motors organization.

Details of VerLinden's future plans are not obtainable but he will head a motor plant which will be established in Lansing to build engines for the Durant four-cylinder car. The Durant car, at the beginning, will be largely an assembled product and it is probable Continental motors will be used until the production of engines begins at the Lansing plant.

VerLinden resigned as superintendent of the Buick Motor Co. nine years ago to become works manager for Olds. Two years later he was made general manager and a short time later was promoted to the presidency. When he joined the Olds organization the output was 2000 cars a year and the plant is now producing about 40,000 cars a year. The factory has been rebuilt and re-equipped under VerLinden's management and more than \$12,000,000 has been expended in bringing it up to its present efficiency. The factory is equipped to build two new models and now has on hand orders sufficient to permit operations on a basis nearly normal for some time to come.

Under the management of VerLinden, the Olds company frequently has led all other units of the General Motors organization and the Oldsmobile rivals Buick and Cadillac in popularity.

R. H. Collins has definitely severed his connection with the Cadillac Motor Car Co. and is devoting his attention to the formation of the Collins Motor Car Co. H. H. Rice has assumed complete direction of Cadillac affairs.

UNITED CUTS BODIES AGAIN

CLEVELAND, May 16—United Automotive Body Co. has made a reduction of 25 per cent in prices on its products, the reduction being the second of its kind within four months.

Exchange Hurts Car Sales Abroad

Need for Stability Is Shown by Hoover

**French and British Makers Combat American Competition
—Other Markets Poor**

WASHINGTON, May 19—Evidence of Secretary of Commerce Hoover's intention to develop foreign markets for American automotive products is given in an official report compiled to-day from questionnaires sent to commercial attaches in European countries, concerning the general economic conditions with special reference to automobiles. The first of a series of reports indicates that the exchange problem is one of the greatest difficulties confronting American automotive exports. American agents abroad reported that foreign manufacturers have not increased production to any great extent because the present economic, financial and industrial depression had affected demand.

The first section of the report issued to-day dealt with automobile markets in France, Italy, England, Belgium, Austria and Czecho-Slovakia. While large American exporting firms have an intimate knowledge of the French market, the official report of Commercial Attache W. C. Huntington is of importance. He stated that the price will be of greater importance in the future and as a consequence French manufacturers are adopting standardization. Domestic manufacturers offer a very formidable competition but American automobiles have become very popular since they were put in general use after the army sold the surplus stocks to the French Government. The size of the average French farm prohibits large sales of tractors.

American Light Trucks Sell

The commercial attache at London reports that the best seller on the English market is a medium sized car of 12 to 18 hp. R.A.C. rating, and fully equipped. There has been a brisk demand for American trucks of 1 to 1½-ton capacity. British manufacturers are doing their best to offset this competition by producing a truck of this kind. They are also beginning to use the pneumatic tires. Because of the exchange situation, the terms usually sought are cash. There is comparatively little demand for tractors and the competition from British manufacturers is very keen.

The exchange is very unfavorable for American cars and the products of local factories in Belgium. Twenty-five per cent of the cars now operated in Belgium are of domestic origin. The Belgian manufacturers are reported for the most part secure financially, although the cap-

AUTOMOTIVE PRODUCTS \$2,000,000,000 IN 1919

WASHINGTON, May 14—Official preliminary production statistics compiled by the Census Bureau show that 312 factories in 1919 produced automobiles worth \$1,181,659,000, or more than double the figure shown by the 1914 census when 300 producers manufactured products worth \$503,330,137.

Products worth \$567,655,200 were turned out in 1919 by 1879 manufacturers of bodies and parts. The total value of automotive products in 1919, therefore, was nearly \$2,000,000,000.

ital of their factories is low. The Belgian cars are firmly built to withstand the excessive vibration caused by the cobble stones on the highways, so that they are better fitted for local usage than the imported car. Owing to the present rates of exchange any advantage in price which the American car selling between \$900 and \$2,000 might possess over the native product has vanished. The Department of Commerce was advised that a recession of the dollar exchange to ten francs would undoubtedly allow American producers to undersell the domestic manufacturers. It is reported that a Fiat chassis can be bought for 18,500 francs. A 10-horsepower Renault complete with solid wheels sells in Belgium for 2200 francs.

Belgium Short on Cash

Belgian manufacturers have fallen down in their efforts to perfect their sales organization. It is customary to furnish dealers with chassis or complete cars on a commission basis, and these vehicles are paid for when sold. The average automobile dealer in Belgium has not a large amount of capital, and therefore must be financed to some extent by the factory or the distributor. If the distributor has subagents, he usually takes 25 per cent of the price and allows the subagent 10 or 15 per cent. Credit sales are made on the basis of 3 and 6 months' notes, but the natural preference is for cash. Tractors are used on the large farms in this country with good results but owing to the small size of the majority of Belgian farms, the market of the tractor will always be limited.

A number of important factors govern the sale of American automotive products in Italy. The radical increase in import duties on motor vehicles has a tendency to prohibit the development of this market. The internal taxes are so heavy that it is practically impossible

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Cleveland to Skip August Depression

Usual Slack Period to Be Overcome by Late Demand, Says Grant Official

CLEVELAND, May 16—The automobile industry, which has been doing more than any other production medium to restore normal conditions in this city, is now to have help from other lines.

The Cleveland Trust Co., after a careful survey, reports that genuine improvement in all lines of business has set in during the month. The reasons for it are lower interest rates here and abroad, better conditions in the Federal Reserve and State and national banks, decreased unemployment, greater activity in all important lines such as automobiles, rubber, textiles, shoes and leather; increased car loadings and greater railroad earnings, stock market advances and greater participation by the public, far-reaching wage agreements in important industries, increased building construction, brighter prospects for reparations agreement, and the rise in value of money of European countries. The last two reasons are considered especially important to all lines of industry, particularly the automobile producer, for they are considered a forerunner to an expansion of foreign trade.

George W. Hubbs, of the Grant Motor Car Co., whose company has moved forward steadily since the first of the year in production and net earnings, predicted that what some term as the annual slack period in August will not be experienced this year. He says that the general business revival, as seen by the Cleveland Trust Co., coming at this time of the year, is certain to continue right through the summer.

"Production of automobiles has been low for many months," said Hubbs. "That fact, coupled with the steady improvement in all lines of business, is certain to keep the automobile factories going through the summer months."

Credit Stringency Passed

The Cleveland Trust Co. says that so far as the Cleveland district is concerned the credit stringency has passed. Automobile producers, as well as leaders in other lines of business in this city, have organized for a movement that has been developed to increase foreign trade here.

Walter C. White, president of The White Co., and C. W. Mears, who handles the advertising for the Winton Motor Co., are members of an executive committee that has been formed to push the sale of stock in the Foreign Trade Financing Corp.

Industry Asks "Stigma Tax" Repeal

Excise Tax Unfair, Senators Are Told

Strong Arguments Presented to
Finance Committee by Graham
and Hanch

WASHINGTON, May 16—Congress has received the tax program of the automotive industry which was offered for its guidance in internal revenue revision. Spokesmen for the industry impressed upon the Senate Finance Committee today the utility of motor vehicles and the urgent need for relief from the oppressive and discriminatory burdens of taxation. While members of the Committee criticized and questioned many of the suggestions for fiscal legislation they indicated that they had a new vision of the magnitude and importance of the automotive industry and its relation to the political and economic structure of the country.

Distinguishing the present mode of taxation, as it applies to the automotive industry as "stigma taxes," had its effect for it revealed to the Senators the inequities under which the automotive industry struggled back to new levels of industrial activity. There were unmistakable evidences of the hostility of Senators to the proposal that the excise tax should be abolished. Their opposition was apparently founded on the supposition that such abolition would pass the burden of highway maintenance upon all classes without distinction as to the users of these arteries of commerce.

Representatives of the industry impressed the Committee with the fact that the highways were now in general use and not confined to motor vehicles, although automobiles bore the entire expenses of maintenance, and in some cases cost and construction.

Shows Suppressing Effects

George M. Graham, vice-president of the Pierce-Arrow Motor Car Company, and a member of the Taxation Committee of the National Automobile Chamber of Commerce, limited his presentation to the specific effects of the present tax system upon the automobile industry. He appeared also for the Motor and Accessory Manufacturers Association. Criticizing these levies as "stigma" taxes served its purpose for it constantly brought to the mind of his auditors the fact that the industry was singled out for heavy and iniquitous assessment. He illustrated the effect of such taxation by comparing them to such regulatory taxes as are levied on liquors, narcotics, dirks and dangerous weapons, the purpose of which was to regulate or even suppress, rather than encourage, the use of such products.

CAR TAX SENSELESS, SAYS NEW YORK TIMES

NEW YORK, May 14—In an editorial discussing the "shocking" methods employed by the Government to obtain its revenues, the New York Times takes issue with the tax proposals of Secretary of the Treasury Mellon. In this connection it says:

"He would increase stamp taxes and, strangely enough, proposes a license tax on the use of automobiles. The automobile is no longer a vehicle of pleasure. It is a common conveyance, necessary to the business man, the professional man and the farmer. Such a tax would be as senseless as one levied upon a farmer's horse and wagon or upon his oxen and cart."

Graham made an effort to disabuse the minds of the Senators as to the term "non-essential" and its application to the industry. He said that at the time it was originated preference in the matter of materials, transportation and labor was given to industries most essential to war activities, but that time had passed.

"We cannot feel that the motor car and the motor truck can be fittingly rated in any classification whose value to the public is questioned," Graham said. "During the discussion of the two previous revenue bills, the opinion was openly expressed that if the increased taxation on passenger cars should curtail their use it would be an excellent thing. Many gentlemen may have felt this with great sincerity during the war period; that they continue to think so now I should seriously doubt.

No Standing if Luxuries

"If the passenger car and motor truck are luxuries we must expect to be rated among the most heavily taxed industries. We have no standing here. But if they are luxuries, then the President of the United States is wrong, for he has placed the stamp of essentiality on cars and trucks. In his first message to Congress he made the very definite statement, 'The motor car has become an indispensable instrument in our political, social and industrial life.'"

It was his contention that a tax on motor vehicles was definitely a tax on transportation. His statement that the railroads have a monopoly after rights of way are constructed was challenged by Chairman Penrose. Graham made it clear that there were no Federal taxes on other units of transportation and

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Ford to Continue 4000 a Day Output

Report of Shut Down July 1
Denied—Company Straining
to Meet Orders

DETROIT, May 18—In denial of reports that the Ford Motor Co. would shut down July 1, officials to-day said the company was far behind in orders and straining every energy to stimulate production to meet demand. As a result the company now is building more than 4000 cars and trucks daily and has been for more than a week. The record for production reached Oct. 20 last year still stands but the plant has been increasing its output almost daily for the last two weeks.

On May 3 the cars and trucks built numbered 3860 and the following day production reached 3992. Two days later the plant ran over the four thousand mark with 4032 cars and trucks and on May 9 turned out 4072. The following day it built 4083. The number for the record day last October was 4688.

The tractor plant also is running at full speed and the ten thousandth tractor was turned out May 3.

This work is being done with a force of about 40,000 men as compared with approximately 60,000 a year ago. The company now is paying a bonus each pay day instead of at the end of the year. It averages about \$3 a week per man.

Slough Trading to Sell Trucks in South America

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duce the established time by something like 50 per cent, contrary to a clause in the national agreement.

Opposition to the anti-dumping legislation proposed by the Government is becoming more active and threatens to jeopardize the Coalition ministry because of the defection of the free traders. One of the features of the proposed legislation which is causing the greatest opposition is the plan to protect British industry at the expense of countries like France and Italy, which have a low rate of exchange.

Now that the price fall is in full swing there will be still greater difficulty in keeping out American products. The buying public is becoming more insistent on knowing why it is possible for American manufacturers to beat the British maker in his own market while contributing 33 per cent to the British Government for the privilege of doing business in that country.

Slough Trucks Here for Sale in U. S.

Truck Company of America
Lands 2000—To Sell at Half
List Price

NEW YORK, May 19—The Truck Co. of America has been organized by L. Mansbach of the Fidelity Motor Supply Co., I. Edward Roskam of the Roskam-Scott Co., and A. B. Messing of New York, and Morris Froelich of Chicago, to deal in American made motor trucks which will be reimported from England. It is understood the new company has purchased approximately 3000 of these trucks from the Slough Trading Co., Ltd., of London which bought them from the British government. Two thousand of the trucks are now in this country.

The trucks, it is stated, will be sold at approximately 50 per cent of the list price. Among the makes included in the purchase are Pierce, Mack, Packard, White, Riker, Locomobile, Liberty, Peerless, F. W. D., Nash and E. M. C. In addition to the trucks the company proposes to import a large quantity of parts for replacement purposes and also accessories of American make.

The company proposes to offer dealer franchises throughout the country and to advertise extensively.

Roskam has been the New York representative of the Slough Trading Co. since it began reimportation of these trucks into the United States. The first large shipment was sent to the Pacific coast but the demand for them was not heavy. It is now believed that with general business conditions approaching a more normal basis there will be an increased demand for these trucks.

The company has leased a building with 45,000 sq. ft. of floor space on the ground floor in 56th Street between 10th and 11th Avenues as well as a warehouse with 35,000 feet of space and a three story office building in West 63rd Street.

It is stated that the company will have an export department with representatives in various foreign countries to offer foreign buyers trucks in large quantities. An especial effort will be made in this country to develop business with road builders.

NASH BUILDS 2½ TON TRUCK

KENOSHA, WIS., May 14—The Nash Motors Co. has brought out a 2½ ton truck which is especially adapted to highway construction work. Its general specifications are much the same as the present 2-ton model, 3018, except that the springing has been made heavier, the wheelbase shorter and some other minor changes have been made to allow for the heavier loads. The price, f.o.b. factory will be the same as the 3018, \$2550. The wheelbase is 121 in. and the space back of the driver's seat about 97 in., this of course depending on the style of body used. Pneumatic tires may be fitted.

OVERLAND ANNOUNCES "SMASHING" PRICE CUT

TOLEDO, May 19—A "smashing price reduction" will be announced by the Willys-Overland Co. in display advertising in the leading newspapers of the country Sunday morning. No information is available as to the range of reduction and a decision on the subject was not reached until yesterday.

C. R. I. & P. Files Protest of Bus Use of Highway

SPRINGFIELD, May 14—The Chicago, Rock Island & Pacific Railway Co. has filed a protest with the State public utilities commission objecting to the use of Illinois' hard roads by motor bus companies as an "appropriation of public improvement to private interest." The protest is directed against the Peoria White Star Bus Co. and the Ivy Way Bus line which the railway complains will force it to curtail its service.

The railway company declares that it already provides sufficient service in operating four trains each day.

"The Chicago, Rock Island & Pacific Railway Co.; as a large taxpayer," the complaint says, "protest against the use of the improved hard roads of the State, recently built at a great cost, by common carriers for hire by automobile and automobile truck, and states the use of said highways by such common carriers amounts to a substantial appropriation of a public improvement by private interests, and for private purposes to the great annoyance and detriment of the public in general.

"The railway company further says the use of said highways by such carriers, who are accustomed to employ large, heavy and cumbersome vehicles, will result in the speedy disrepair, deterioration and destruction of said highways, and without any compensation from the private enterprises so using and abusing them."

EIGHT INDUSTRIES SHOW GAINS

WASHINGTON, May 18—Increased employment in eight major industries is shown in Labor Department figures for April. The largest increase was 25.2 per cent in the automotive industry. The others which showed increases were woollens, hosiery and underwear, men's clothing, silks, cigars, cotton finishing and boots and shoes.

PAIGE TO MAINTAIN PRICE

DETROIT, May 17—Paige Motor Car Co. has sent a notice to its dealers that there would be no price reduction now and none in the near future. President Jewett said he did not believe in guaranteeing prices but there was nothing in the cost of manufacture to justify any price reduction in so far as his company was concerned.

Automotive Activity Grows in Milwaukee

Passenger Car Engine Makers at
Capacity — Truck Engine
Makers Report Gains

MILWAUKEE, May 16—It has been especially gratifying to commercial, industrial and civic organizations of Milwaukee to be informed by governmental sources that one of the reasons that Milwaukee is one of the few large cities of the country showing an increase in number of men employed is the steady expansion of production in the automotive industries. This increase is being accentuated day by day by the re-employment of men who were laid off months ago, as well as the extension of working schedules of men who were retained at reduced hours.

Engine manufacturers specializing in passenger car power units are now operating at capacity, with several reporting overtime schedules in some departments. Makers of heavy duty engines for trucks and tractors are doing better, especially the former. Employment in service and repair shops continues to increase, due to the necessities of a situation in which used cars taken in trade are more numerous than ever before and buyers of renewed cars insist that the mechanical condition must be first class.

The merchandising of passenger cars continues to proceed very satisfactorily in Milwaukee and vicinity. Business is losing the spotty character of recent months. Sales are made with more freedom and cover the entire range of price classifications rather than the cheapest or the higher-priced vehicles, as before. It is noted, however, that the announcements made during the first two weeks of May by numerous manufacturers concerning price reductions has had an influence upon a good many prospective buyers who were considered the liveliest kind of prospects but suddenly resisted further sales effort on the plea that they intend to await developments in respect to future prices.

This has caused many dealers to offer on their own responsibility or by arrangement with maker and distributor to protect buyers to July 1 or even Aug. 1. Used car sales have been stimulated by special sales conducted by numerous big dealers.

FIRE DAMAGES STUTZ PLANT

INDIANAPOLIS, May 14—Production at the plant of the Stutz Motor Car Co. here will be seriously crippled for six weeks because of a fire in the warehouse of the plant late yesterday. The damage has been estimated at \$100,000. He said it would be more than a week before the stock could be removed from the warehouse and the damage correctly estimated. The fire started in some cotton trimmings on the third floor of the four story building and serious water damage was sustained.

Exchange Rates Hurt Car Sales Abroad

Taxes Discourage Sales in Italy— Austrian Factories to Build 800 Cars in Year

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to sell to any class but the rich. The policy of the Government had been to discourage the use of motor cars. A heavy graduated tax was imposed not long ago, running from 2850 lira on low-powered cars to 15000 lira on cars rated at over 50 horsepower. There are not many medium or low-priced American cars imported and the Fiat company is reported producing 60 cars per day with an anticipated production of 200 cars per day when their new factory is completed. The Italian industry has always been dependent to a large extent upon export business. The Italian farmer has not been educated to a point where he can readily be persuaded to purchase tractors.

The economic conditions in Austria discouraged the purchase of motor cars. It is doubtful whether more than 800 cars will be produced during the current year in Austrian factories which have a capacity of from 20,000 to 25,000 cars a year. The depreciation of the Austrian currency is so great that it practically removes the element of foreign competition, inasmuch as the cost of foreign cars is too high for purchase by Austrians. American foreign agents state that if large amounts of foreign capital should be invested in Austria in the production of motor cars, the same circumstances would react to the disadvantage of the local manufacturers, as a comparatively small investment in sound currency would create a large capital in Austrian currency. Austrians are not willing to abandon their draft horses.

American cars have gained popularity in Czecho-Slovakia, particularly of late when the adverse exchange has made the low-priced cars the best sellers. There has been a demand for four and five-ton trucks. Shipments of American goods have been made via Hamburg because of the convenience of river transportation down the Elbe to Prague.

To Confer on Exports

NEW YORK, May 17—At the request of Herbert Hoover, a committee headed by J. Walter Drake has been appointed by President Clifton of the National Automobile Chamber of Commerce to confer with the Department of Commerce. The other members of the committee are: Arthur Waterfall, vice-president, Dodge Brothers; E. A. Williams, Jr., president, Garford Motor Truck Co.; Alfred H. Swayne, vice-president, General Motors Corp., and Percy Owen, president, Liberty Motor Car Co.

FRANCE HOLDS USED CAR FAIR

NEW YORK, May 16—Details have been received here of the used automo-

bile fair which will be held at Limoges, France, May 23 and 24. The fair is being organized by the Automobile Club of France and none but used machines will be admitted to the grounds. On the first day, sales will be conducted by private negotiations but on the second day there will be an auction for owners who wish to dispose of their cars in this way. Limoges has been chosen by the fair not only because it is centrally located but also in order that the cars which will be for sale will be in good condition because they will have to travel there under their own power.

Motor Vehicles Gain in 1920 Transportation

NEW YORK, May 16—Statistics compiled by the National Automobile Chamber of Commerce show that automobile passenger travel neared the five billion mark in 1920. Fully 4,932,000,000 persons were carried by motor cars during this period, as compared with the 1,234,222,889 revenue passengers of the railroads.

Motor trucks hauled 1,200,000,000 tons of freight, or nearly half the amount carried by rail lines, which totalled 2,504,000,000 tons.

The growth of the automobile business has not been competitive with the railroads, however. Much of it is directly tributary, as in bringing both passengers and freight from farm to train, and in suburban service to cities. Another large field for highways transport when not directly tributary to railroad is the travel from point to point over short haul distances where there is no other means of communication.

The motor car passenger figures increased 400,000,000 during 1920 due to the gain in motor vehicle registration. At the same time the railroads showed a gain of 60,000,000 revenue passengers.

REMY TO WELCOME S. A. E.

ANDERSON, IND., May 16—Remy Electric Co. will hold open house at its factory on May 22 and 23, the dates of the summer meeting of the Society of Automotive Engineers, at West Baden. In sending out invitations to the engineers to visit the factory, the company points out that it is mid-way between both Detroit and Chicago and the meeting place and that "good old Hoosier meals" will be served those stopping over. Automotive manufacturers in all parts of Indiana are planning to extend hospitality to the visiting delegates.

TO REFUND BEARINGS TAX

NEW YORK, May 17—The Motor and Accessory Manufacturers Association has been informed by the Commissioner of Internal Revenue that manufacturers of bearings and bushings who have paid taxes on them as automobile parts or accessories when they had not been manufactured to specification or solely for use in motor vehicles are entitled to refunds on taxes paid since Feb. 25, 1919. These refunds will aggregate many thousands of dollars.

METAL MARKETS

EVEN amid the from day-to-day buying which constitutes the only form of activity in the steel market just now, purchasing agents feel the ground sliding from under the prices that a few weeks ago were proclaimed in certain quarters as "stabilized." In fact, conditions are parallel to those that prevailed previous to the last reduction in the leading interest's price schedule. The steel mills that succeed in obtaining what orders for small tonnages are available characterize their shading of prices as special concessions on desirable business. Their unsuccessful competitors call it price cutting. Far from being extraordinarily pleased with their purchases, the buyers of these odd tonnages almost invariably regret that they could not postpone placing their orders, feeling that had they been able to do so they could have saved money. Meanwhile active preparations against the coming of lower prices are being made by producers. One of the largest "independents" in the Youngstown district has taken the lead in abolishing the eight-hour day as a basis for wage computation, and hereafter straight time on an hourly basis will be paid. Other "independents" are following suit. On the basis of the last bi-monthly wage settlement between the Amalgamated Association of Iron, Steel and Tin Workers and the Association of Independent Sheet and Tin Plate Manufacturers, the conversion charge for No. 28 gage black sheets has been reduced to \$17.11, which compares with \$24 when sheets were on a 5.80c. card. Numerous operating economies are being instituted and result in steadily diminishing production costs. Unless the leading interest anticipates the evolution of a lower market by another cut in prices, the industry faces another period of slowly sagging values, and the uncertainty that attends such a condition is alike unsatisfactory to the purchasing agent and to the producer. Representative business will not be placed until the situation has clarified further, and what odd lot buying will be made necessary by immediate requirements will be a matter of individual negotiation in which "publicational" quotations will form a basis for concessions.

Pig Iron.—Were it not for accumulations of resale iron still pressing on the market its liquidated character in point of production and prices would be highly impressive. The melt in Middle West foundries is slowly increasing, due to foundry crafts being in a more reasonable frame of mind. With Foundry No. 2 selling at \$23.50, valley, automotive foundries would be disposed to contract for a reasonable time ahead, were it not for the hand-to-mouth buying of automotive castings by passenger car and truck builders.

Steel.—The \$39 price for sheet bars has apparently once more gone by the board, and non-integrated sheet mills could probably shade this figure fully \$2 on representative orders. Youngstown automobile sheet makers are once more disgruntled over the paucity of orders. Cold rolled strip steel continues to be inquired for in modest quantities by the automotive industries, but concessions are asked in price. Bolts and nuts are in better demand, with the Ford Motor Co. figuring as purchaser in the Chicago market. Heavy forgings are also more actively sought by automotive builders.

Aluminum.—The market still waits for activity on more definite news from Washington regarding the outlook for a higher tariff.

FINANCIAL NOTES

International Motor Truck Co. reports net profits for the quarter ended March 31, 1921 of \$4,396. Present incoming business justifies an expectation of deliveries for the present quarter at the rate of 6000 trucks per annum. Net profits for the first half should show preferred dividends fully earned. The company has net working capital in excess of \$19,000,000 and a cash balance of more than \$3,000,000. The company has reduced inventories since Jan. 1 about \$1,500,000.

Parish & Bingham Corp. reports sales for the first four months of 1921 as representing 41.14 per cent of sales for the corresponding period in 1920. The plant has been operating daily since Jan. 15 and maintained an average of 24.53 per cent of men employed. Releases scheduled for May are considerably in excess of \$600,000 and additional releases are being received daily.

Stewart-Warner Speedometer Corp. reports net earnings for the first quarter ended March 31 of \$50,527. Payment of a dividend of \$1 a share, or \$395,000, made it necessary to draw on surplus for nearly all of that amount, reducing the surplus to \$6,697,86 compared with \$8,092,865 on Dec. 31 last.

Marion Tire & Rubber Co. will increase its capital from \$750,000 to \$1,250,000, the additional capital to be used in broadening the activities of the company. C. J. Davis of Cleveland has been elected president and general manager of the company.

Elgin Motor Car Corp. for the year ended Dec. 31, 1920, shows that total sales were \$7,382,606, as compared with \$6,479,100 in 1919. Net profits for the year 1920 amounted to \$195,908, a considerable increase over earnings of the previous year.

INDUSTRIAL NOTES

Minneapolis Steel & Machinery Co. has moved its New York offices from the Tribune Building to the Woolworth Building. The main export offices of the company will in the future be located at the factory in Minneapolis. C. W. Hadden, manager of foreign sales, will make his headquarters at Minneapolis. J. A. Teach will continue in New York as contracting engineer and designer for the domestic and export trade.

Essenkay Products Co., Chicago, has leased from the Chicago Consolidated Brewing & Malting Co. a two-story building for ten years at a term rental of \$85,000. The property will be remodeled at a cost of \$150,000 and used for general offices, sales-room and factory.

Hilbert Mfg. Co., Hilbert, Wis., and Mullins Mfg. Co., Brillion, Wis., both makers of farm equipment, have been consolidated as the W. M. Mullins Mfg. Co., with \$200,000 capital. The Mullins company will remove its plant equipment to Hilbert, which plant will be enlarged.

Lansing Bus Co., Lansing, Mich., has been organized to distribute special bodies for all makes of truck chassis, the bodies to be placed with truck makers for mounting on chassis at buyers' orders. Fred L. Waite will be manager of the new company.

REES TO BUILD FREIGHT CAR

COLUMBUS, May 14—The Rees Motor Co., with headquarters in the Commerce Building, has been re-incorporated

with an authorized capital of \$300,000 and will soon locate a factory for the manufacture of the Rees automobile, a two litre high-grade car weighing 1850 lb. J. H. Rees, the originator of the car, has spent six years experimenting and solving the problem of producing a light car.

One of the features is the system of spring suspension. A specially designed carburetor is also featured. Rees is president and general manager; J. L. Stanton, vice-president; S. W. Moisselle, secretary and M. R. Slayback, treasurer.

Develop Steam Car
to Sell at \$1000

INDIANAPOLIS, May 13—A 5-passenger steam car to sell at \$1,000 is being developed by George A. Coats, head of the Coats Machine Co. of this city. The power system is the invention of a Norwegian engineer who came to this country during the war to investigate the development of internal combustion engines here. The car will have a 110 in. wheelbase and will be equipped with electric lighting and an electric fuel heating outfit for starting.

The boiler of the new car is of the combined fire tube and water tube type and goes under the hood. An advance over previous practice in light boiler construction is said to consist in the top and bottom welding of the boiler tubes. There are really two engines arranged in a single unit and mounted directly on the rear axle, each engine driving one of the axle shafts, so that no differential gear is required. The housing of each half of the axle carries three fixed cylinders, set 120 deg. apart. These cylinders are of the single acting, poppet valve type. They have a bore of 2 3/4 in. and a stroke of 3 in.

The three connecting rods of each engine connect to a crank pin integral with the drive shaft of each wheel, thus dispensing with all gearing. With a car speed of 40 m.p.h. the engine turns at 500 r.p.m. Kerosene is used as fuel and 1 gal. is said to be sufficient for from 20 to 40 miles, the exhaust is condensed and one filling of the water tank gives a mileage of 300 to 500. It is planned to manufacture a light truck for delivery work on the same chassis.

KNOX TIRE OFFICERS INDICTED

MT. VERNON, OHIO, May 16—Five officers of the Knox Tire & Rubber Co. have been indicted on charges of violating the blue sky law. The men indicted are R. E. Frantz, president; S. D. Spencer, secretary; V. V. Hendershott, E. Scott Cannell and C. B. Carpenter, members of the board of directors.

COLLINS BUYS ONE BUILDING

DETROIT, May 16—R. H. Collins has purchased only the main building of the old Cadillac factory here and not the entire plant as announced last week. The various other buildings are retained by the General Motors Corp.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

NEW YORK, May 19—The local call money market showed a firmer tendency last week after opening at 6 1/2 per cent on Monday. The following day and until Friday, when a 6 1/2 per cent renewal rate was again quoted, the ruling rate had been 7 per cent. The firm tone was probably due to the anticipation of the shifting of funds at the opening of the present week incident to government operations and to the payment of subscriptions due on the \$230,000,000 Northern Pacific-Great Northern issue.

On Monday of this week interest was due on the second 4 per cent Liberty Bonds and the second 4 1/4s, and there was due \$232,124,000 of Certificates of Indebtedness. At the same time, the Treasury Department was to bring forth a \$200,000,000 5 1/2 per cent issue. Following the easy tone in the early part of the week, rates for sixty and ninety days' and four months' paper stiffened to 6 1/2 to 6 3/4 per cent. Five and six months' paper was unchanged at 6 to 6 1/2 per cent. There was moderate trading in the time money market, with few important transactions.

The mid-week statement of the Federal Reserve System showed another increase in gold reserves and a further reduction in Federal Reserve note circulation. These two factors were mainly responsible for the improvement shown in the reserve position of the System. The ratio of total reserves to deposit and Federal Reserve note liabilities combined increased from 55.3 per cent to 55.9 per cent—the highest ratio since August, 1918.

The April figures for our foreign trade show a continuation of the decline which has been characteristic of recent months. Exports for the month were valued at about \$340,000,000, as against \$386,800,000 in March, 1921, and \$684,700,000 in April, 1920. Imports at \$255,000,000 mark an increase of approximately \$3,000,000 over the March figures, but a decrease of \$240,700,000 from the figures of the corresponding month a year ago. Exports were the smallest for any month since January, 1916, and the excess of exports amounted to only \$85,000,000. Exports of gold for the month totaled only \$400,000, while gold imports amounted to \$92,000,000. The inflow of gold has continued at about the same rate during the first two weeks of May.

The Dallas Federal Reserve Bank has just announced a reduction of its discount rate from 7 per cent to 6 1/2 per cent. This means that six of the Federal Reserve banks now have a 6 per cent rate on commercial discounts, and four have a 6 1/2 per cent rate. A significant ruling of the Federal Reserve Board is that made at the close of last week regarding the eligibility of six months' bankers' acceptances in import and export transactions. Under a new regulation, this type of paper becomes eligible for open market purchase by Federal Reserve banks.

MEN OF THE INDUSTRY

A. H. Bartsch, general sales manager of the American Bosch Magneto Corp., has returned from a two months' trip of 10,000 miles, during which he visited service stations and distributors in the South, Southwest and on the Pacific Coast. He reports that nearly everywhere greater effort is required to get business, but that service stations are conducting intelligent and aggressive sales campaigns. Most Bosch service stations now are handling the new shaft drive Bosch magneto attachment for Ford cars and Fordson tractors.

E. A. Blake has been appointed service engineer of the Transport Truck Co., Mt. Pleasant, Mich. Before joining Transport he was assistant superintendent of the Republic Truck Sales Corp.'s engine division at Alma, Mich. He has also been in the engine department of Curtiss Aeroplane Co., Inc., and before that was with Maxwell and Standard.

Fred G. Whipple, division sales manager for the Service Motor Truck Co., Wabash, Ind., has been appointed sales manager in California, Arizona and Nevada. Walter Dix, formerly of the Packard Motor Car Co., has been appointed to succeed Whipple in Maryland and Virginia and parts of Delaware and North Carolina.

Louis E. Clarke, who for several years has been connected with the manufacturing department of the Hoyt Metal Co., both in the East and the Middle West, has been appointed sales manager of the babbitt-lined bronze bushings and die casting departments, with offices in the Boatmen's Bank Building, St. Louis.

Frederick P. Nehrbaas has become associated with George A. Weidely as works manager of the Weidely Motors Co., Indianapolis. Nehrbaas has been connected with the industry since 1900, having been with E. R. Thomas Motor Car Co., Alco, Lyons-Atlas Co., and latterly with Premier.

Frank E. Wodell, assistant sales manager of the General Motors Export Co., has been given a leave of absence of six months to rest after eleven years of activity with General Motors, the last eight with the export company. Wodell will spend his leave on camping trips in the Rockies.

E. J. Shassberger has been named advertising manager for the Olds Motor Works, succeeding Thomas O'Brien, who has been promoted to assistant sales manager. Shassberger has been with Olds about four years in the sales department and was assistant to O'Brien.

O. C. Berry has joined the staff of the Wheeler-Schebler Carburetor Co., Indianapolis, as chief engineer. He was formerly professor of automotive engineering at Purdue University and research engineer for the Hupp Motor Car Corp.

Paul E. Ryan has been appointed sales manager of the Templar Motors Corp., Cleveland, succeeding Harry Anderson. Ryan was formerly with the Aluminum Castings Co., Perfection Spring Co. and the National Acme Co.

Jay Dewey, general sales manager of the Lexington Motor Co., will spend the balance of the year on the Pacific Coast directing sales activities in that section.

J. A. Callahan, vice-president in charge of production of Martin-Parry Corp., Indianapolis, has been elected vice-president and general manager of the company.

H. H. Crawford will be special representative for the Gier Tuarc steel disk wheel in the territory of Michigan, Illinois, Indiana, Wisconsin and Ohio.

Warren D. Oakes, president of the Oakes Co., Indianapolis, will sail for Europe June 1, to establish agencies in Belgium, Scotland, England and France.

C. E. Pumphrey has resigned as sales manager of the McGraw Tire & Rubber Co. and has been succeeded by W. H. Hurley, assistant sales manager.

Charles E. Speaks has been appointed European manager for the Firestone Tire & Rubber Co., with headquarters in London.

Norman DeWind, originator of the motor road roller, has severed his connection with the Austin Mfg. Co., Chicago.

Ford Dealers Combine for Used Car Disposal

CINCINNATI, May 23—Automobile men over the country are showing much interest in a plan that is being tried out by the Ford dealers in the Cincinnati territory, who have organized the Ford Dealers Corp. with a capital stock of \$75,000 to handle the sales of used Ford cars in this territory.

The stock is divided equally among the 14 authorized Ford dealers in the three counties—Hamilton County, Ohio and Kenton and Campbell counties, Ky., just across the river from Cincinnati.

The purpose of the corporation is to handle used Ford cars which are offered in exchange for new cars, and, hereafter, when a man with an old model wishes to trade it in on a new car, he will be referred by the dealer to the corporation, where a cash sum will be offered him for the machine. The corporation will, in turn, dispose of the machine through the usual second-hand methods. This will permit dealers to eliminate the troublesome features of handling and financing second-hand cars.

C. H. Peterman is president of the corporation; J. A. Wissell, vice-president, and H. J. Berning, secretary and treasurer.

A.A.A. Visits Harding, Approves Townsend Bill

WASHINGTON, May 17—Representatives of the American Automobile Association in convention here this week called upon President Harding to-day, and pointed out the need for better highways and expressed hearty approval of the proposed Townsend bill, which is now before the Senate. Later the delegates attended hearings of the Senate Committee on Post Office and Post Roads, which is gathering opinions as to the effectiveness of the Townsend bill in correcting abuses now existing in highway administration.

The delegates discussed automobile thievery, policing for the National high-

ways, opposed the discriminatory taxes on automobiles, and discussed the gasoline price situation.

Senator Townsend and other legislators addressed the conference at a dinner given Monday at Hotel Washington.

Western Radiator Formed to Combine 2 Companies

CHICAGO, May 18—The Western Radiator Corp. has been organized to take over the Hooven Radiator Co. and the B. & W. Mfg. Co., both of this city. The purchase of these two companies gives the Western Radiator Corp. one of the most complete lines of radiators. Production will continue in the fine Western Avenue plant to which the B. & W. equipment is being moved. Additional equipment has been provided for increased production of numerous types of radiators. The factory has a capacity of fully 2000 radiators a day.

New Jersey to Campaign for Fair Legislation

NEWARK, May 16—The New Jersey Automotive Trade Association, at its annual meeting in the Robert Treat Hotel here this afternoon, decided to carry its fight for better highways direct to the people and make it a dominant issue in the election of State legislators next fall.

The dealers are aroused by a condition which practically amounts to the stoppage of all highway development in 1922. The last Legislature, after increasing automobile fees and providing for a larger program of highway development than was asked for by the automotive interests through the State Highway Commission, failed to provide a proposed bond issue which would make highway improvement possible.

After hearing a report of George Paddock, one of the State Highway Commissioners, showing the deplorable condition of the highway program the association was unanimous in a resolution pledging itself to use every effort possible to acquaint the people of the State with the situation so that there may be no further delay than already occasioned. It was further resolved that the fight be carried into every county and that the citizens be asked to send to the Legislature only men favorably disposed toward good highways and who are familiar with highway problems.

CARPENTER ATLAS PRESIDENT

LANSING, MICH., May 14—Samuel H. Carpenter, former secretary of the Atlas Drop Forge Co., has been made president and general manager and will be succeeded as secretary by J. P. Hopkins, who also will retain the position of vice-president. Earl W. Goodnow was elected to the board and will become assistant secretary.

The changes were announced at a meeting of the board of directors Tuesday at which the favorable financial condition of the company was drawn to the attention of the stockholders.

Calendar

SHOWS

- Sept. 28 - Oct. 8 — New York, Electrical Exposition, 71st Regt. Armory, Electric Equipment, Machinery and Vehicles.
- Nov. 27-Dec. 3—New York, Automobile Salon, Hotel Commodore.
- January — Chicago, Automobile Salon, Hotel Drake.

FOREIGN SHOWS

- May 28, 1921 — Czecho-Slovak International Automobile Exposition of Cars, Trucks, Tractors, Motorcycles and Equipment. Prague.
- May 28-June 8 — International Automobile Exhibition, Basle, Switzerland.

June, 1921—Reykjavik, Iceland, Agricultural Exhibition—Agricultural Machinery—Icelandic Agricultural Society, Reykjavik, Iceland.

September—Buenos Aires, Argentina, Passenger Cars and Equipment. La Pabellon de las Rosas. Automovil Club Argentino.

September—Buenos Aires, Argentina, Cars, Trucks, Tractors, Farm Lighting Plants and Power Farming Machinery. Palermo Park: Sociedad Rural Argentina.

September—Luxemburg, Luxemburg, Agricultural Sample Exhibition.

Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais,

Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

Nov. 4-12 — London, British Motor Show, Society Motor Mfrs. and Traders.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

CONVENTIONS

May 23-26 — Chicago, A.S.M.E. Spring Meeting, Congress Hotel.

May 24-28—West Baden, Ind., Summer Meeting Society of Automotive Engineers, West Baden Springs Hotel.

July 4-9 — Mackinac Island, Mich., Summer Meeting Automobile Equipment Association.

Oct. 12-14, 1921 — Chicago, Twenty-eighth Annual Convention National Implement & Vehicle Assn.

RACES

May 30 — Indianapolis, International Sweepstakes.

June 3-5 — Reno, Nev., First Annual Nevada Highway Road Race.

June 18—Uniontown, Pa., Speedway Events.

July 25—Grand Prix, Le Mans. Labor Day—Uniontown, Pa., Autumn Classic.

INDUSTRY ASKS SENATE TO REPEAL "STIGMA TAX"

(Continued from page 1085)

that the industry should be relieved of the sales tax on cars, trucks and repair parts.

Replying to a statement of Senator Simmons of South Carolina, ranking Democratic member of the committee, that the Government did not build the road beds for the rail carriers as it did for the automotive industry, Graham pointed out that nobody ever heard of steamships digging their own channels or building their own harbors, but that the Government paid for it. This illustration was considered very apt. He said that the industry pays enough for the maintenance of all vehicles. Graham placed the automobile industry in favor of a sales tax, provided it is extended to all industries and as such would be equitable. Objection was made as to confining it to the automotive industry because it would be highly discriminatory.

Hanch Outlines Appeal

C. C. Hanch, chairman of the National Automobile Chamber of Commerce Taxation Committee, opened the argument for the industry. He outlined the recommendations of the organization, emphasizing the need for economy in Governmental expenditures. His suggestion that Federal expenditures be held to \$2,000,000,000 annually was well received. Senator Penrose, chairman of the committee, inquired of Senator Smoot, ranking Republican member of the Senate Appropriations Committee, whether this was possible under existing conditions. Senator Smoot answered that they could not possibly reduce expenditures to \$2,000,000,000 and take care of the proposed soldiers' bonus. Mr. Hanch found many sympathizers on the committee when he suggested that "it is time for at least a brief naval and military vacation."

The committee questioned Mr. Hanch closely as to the effect of the excess-profits tax. His assertion that there was

a vast preponderance of public opinion for the repeal was questioned by Senator McCumber, who contended that the farmers did not want it repealed. Responding to a question of Senator Simmons, Hanch insisted that the excess-profit tax was a consumption tax in the last analysis.

Senator Penrose wanted to know of the discriminatory effect of such tax, as had been alleged by the automotive industry. Hanch said it discriminated against conservatively financed institutions and favored extravagantly managed concerns, put a limit on initiative and was extremely uncertain of return. He furthermore insisted that it was unfair in principle, as was true of the excise tax.

Hanch emphasized the need for lessening the tax burden on industry, particularly during the reconstruction period. He expressed the opinion that no additional burdens would be required before 1923, provided the Government was prudently conducted and a tight rein kept on expenditures. He indorsed the sales tax only in the event that additional revenue is needed and is placed on all industry.

Hearings to Continue

Hearings on the Internal Revenue revision will be continued for several weeks in order that the committee may ascertain the views of the country on this problem which vitally affects all.

The House Committee on Ways and Means undoubtedly will take up this matter after the tariff measure is reported, probably by May 26.

"A very strong impression was made upon the members of the committee," said Alfred Reeves, general manager of the National Automobile Chamber of Commerce, after the hearing to-day. "We were delighted with the reception accorded us. The committee was a hundred per cent more friendly than ever before, and seemed keenly alive to the

problems confronting the industry. Much interest was shown on the part of the committee by its questions as to our attitude on current tax problems, and we were able to give convincing replies. Quoting President Harding carried much weight."

Presenting the industry's views on highway legislation before the Senate Post office committee, Graham said:

"National development and the need for economy demand the formation of a highway policy under a Federal Commission.

"The economic barrier now confronting us is the lack of adequate highways. There is urgent need to build these highways as quickly as possible.

"Highways should be planned with consideration of their relationship to railway and waterway communication. The highway question concerns agriculture, commerce, the military and the social needs of the nation.

"Highway policy, therefore," Graham continued, "should be unified under a Federal Highway Commission directly responsible to the chief executive, as is now the policy in State road administration.

"Economy will be served by such a measure as roads will be built with regard to all the needs of the nation. It will be possible to pay higher salaries than can now be done under the bureau system. Millions of dollars are to be expended on roads, and it is the highest economy to secure the ablest brains in the country for this administration."

CORRECTION

DETROIT, May 16—In the story on production in the Detroit district printed in AUTOMOTIVE INDUSTRIES last week the statement was made that "an interesting fact in connection with the Reo business is that its foreign trade has fallen to approximately half its normal total." This reference should have been to farmer trade instead of export business.